CHEMICALS IN FOODS AND COSMETICS

HEARINGS

BEFORE THE

HOUSE SELECT COMMITTEE TO INVESTIGATE THE USE OF CHEMICALS IN FOODS AND COSMETICS

HOUSE OF REPRESENTATIVES

EIGHTY-SECOND CONGRESS

FIRST SESSION

PURSUANT TO

H. Res. 74 and H. Res. 447

(Continuing investigation and study begun under H. Res. 323, 81st Cong., 2d sess.)

PART 2

WASHINGTON, D. C., OCTOBER 9, 1951
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CHEMICALS IN FOODS AND COSMETICS

TUESDAY, OCTOBER 9, 1951

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE TO INVESTIGATE THE
USE OF CHEMICALS IN FOOD PRODUCTS AND COSMETICS,
Washington, D. C.

The select committee met, pursuant to House Resolution 74, Eighty-second Congress, first session (authorizing the continuation of the investigation and study begun under authority of H. Res. 323, 81st Cong. 2d sess.), at 10:12 a. m., in room 304, Old House Office Building, Hon. Thomas G. Abernethy presiding.

Present: Representatives Abernethy of Mississippi; Hedrick of West Virginia; Jones of Missouri; Miller of Nebraska; and Horan of Washington.

Also present: Vincent A. Kleinfeld, chief counsel to the committee, and Alvin L. Gottlieb, associate counsel.

(The resolutions granting authority to the committee are as follows:)

82D CONGRESS
1ST SESSION

H. RES. 74

IN THE HOUSE OF REPRESENTATIVES

JANUARY 17, 1951

Mr DELANEY submitted the following resolution; which was referred to the Committee on Rules

JANUARY 29, 1951

Referred to the House Calendar and ordered to be printed

FEBRUARY 2, 1951

Considered and agreed to

RESOLUTION

Resolved, That effective from January 3, 1951, the select committee created by H. Res. 323 of the Eighty-first Congress is authorized to continue the investigation and study begun under authority of such H. Res. 323 and for such purposes shall have the same power and authority as that conferred by such H. Res. 323. The committee shall report to the House (or to the Clerk of the House if the House is not in session) as soon as practicable during the present Congress, the results of its investigation and study, together with such recommendations for legislation as it may deem advisable.

82D CONGRESS
1ST SESSION

H. RES. 447

IN THE HOUSE OF REPRESENTATIVES

OCTOBER 4, 1951

Mr. DELANEY (by request) submitted the following resolution; which was referred to the Committee on Rules

OCTOBER 8, 1951

Referred to the House Calendar and ordered to be printed

OCTOBER 15, 1951

Considered and agreed to

RESOLUTION

Resolved, That H. Res. 74, Eighty-second Congress, is amended by adding, after the words "H. Res. 323," in the fourth line, a comma and the following language: "and an investigation and study of the nature, extent, and effect of the use of chemicals, compounds, and synthetics in the production, processing, preparation, and packaging of cosmetics to determine the effect of the use of such chemicals, compounds, and synthetics upon the health and welfare of the Nation,".

81ST CONGRESS
2D SESSION

H. Res. 323

IN THE HOUSE OF REPRESENTATIVES

AUGUST 10, 1949

Mr. SABATH submitted the following resolution; which was referred to the Committee on Rules

JUNE 12, 1950

Referred to the House Calendar and ordered to be printed

JUNE 20, 1950

Considered and agreed to

RESOLUTION

Resolved, That there be, and hereby is created a select committee to be composed of seven Members of the House of Representatives to be appointed by the Speaker, one of whom he shall designate as chairman. Any vacancy occurring in the membership of the committee shall be filled in the same manner in which the original appointment was made.

The commitee is authorized and directed to conduct a full and complete investigation and study of—

(1) the nature, extent, and effect of the use of chemicals, compounds, and synthetics in the production, processing, preparation, and packaging of food products to determine the effect of the use of such chemicals, compounds, and synthetics (A) upon the health and welfare of the Nation and (B) upon the stability and well-being of our agricultural economy;

(2) the nature, extent, and effect of the use of pesticides and insecticides with respect to food and food products, particularly the effect of such use of pesticides and insecticides upon the health and welfare of the consumer by reason of toxic residues remaining on such food and food products as a result of such use; and

(3) the nature, effect, and extent of the use of chemicals compounds, and synthetics in the manufacture of fertilizer, particularly the effect of such use of chemicals, compounds, and synthetics upon (A) the condition of the soil as a result of the use of such fertilizer, (B) the quantity and quality of the vegetation growing from such soil, (C) the health of animals consuming such vegetation, and (D) the quantity and quality of food produced from such soil, and (E) the public health and welfare generally.

The committee shall report to the House (or to the Clerk of the House if the House is not in session) as soon as practicable during the present Congress the results of its investigation and study, together with such recommendations for legislation as it may deem advisable.

For the purpose of carrying out this resolution the committee, or any subcommittee thereof authorized by the committee to hold hearings, is authorized to sit and act during the present Congress at such times and places within the United States, whether the House is in session, has recessed, or has adjourned, to hold such hearings, and to require by subpena or otherwise, the attendance and testimony of such witnesses and the production of such books, records, correspondence, memoranda, papers, and documents, as it deems necessary, to employ upon a temporary basis such technical, clerical, and other assistants as it deems advisable to utilize the services, information, facilities, and personnel of all agencies in the executive branch of the Government. Subpenas may be issued under the signature of the chairman of the committee or any member of the committee designated by him, and may be served by any person designated by such chairman or member.

Mr. ABERNETHY. The hearing will come to order.

Who is first, Mr. Kleinfeld?

Mr. KLENFELD. Dr. Griffin.

Dr. GRIFFIN. I have with me Mr. Billings and Mr. Ward.

Mr. ABERNETHY. Would you like them to sit at the table with you, Doctor?

Dr. GRIFFIN. Please.

Mr. ABERNETHY. All right, sir.

It is the custom of this committee to swear the witnesses. Would you please raise your hands?

(The oath was administered by the chairman.)

TESTIMONY OF E. L. GRIFFIN, PH. D., ASSISTANT CHIEF, INSECTICIDE DIVISION, PRODUCTION AND MARKETING ADMINISTRATION, DEPARTMENT OF AGRICULTURE; ACCOMPANIED BY SAMUEL C. BILLINGS AND JUSTUS C. WARD

Mr. KLEINFELD. Dr. Griffin, first I want to thank you for coming back here.

On page 6 of your statement, you say that if an economic poison is intended to be used on foods or food crops, the information and the proposed labeling are submitted to the Food and Drug Administration, and that registration on any product is issued only after this thorough consideration.

Can you tell this committee whether every economic poison which has been registered has been submitted to, and been passed on by, the Food and Drug Administration?

Dr. GRIFFIN. I explained in my testimony when I was here in April that those economic poisons which were already on the market have

been treated somewhat differently from the new ones which have come on since then. I think it was very clear in the hearings at the time our bill was passed that the Congress did not want us to upset the economic poison business by delaying all registrations unless we could make complete investigation on each product. So the products which were on the market at that time were registered on the basis of safe usage without going back to the Food and Drug Administration. Now the new chemicals which have come on the market since that time have been treated differently. In cases where the new chemical was one which was likely to be used on food products or likely to be used in such a way that it would possibly contaminate foods we have gone to the Food and Drug Administration. Where it was a product which had somewhat high toxicity and it happened to be dangerous to people in its usage without contaminating foods, we would go to the Public Health Service, which is more in charge of that particular type of work.

It has been, I will say, our consistent policy where there are new products being registered and food contamination was likely, to go to the Food and Drug Administration.

Mr. KLEINFELD. Are you saying, Dr. Griffin, that every new chemical that was not on the market at the time the present insecticide law was passed was submitted to the Food and Drug Administration for clearance?

Dr. GRIFFIN. That has been our policy. Now if we have missed some, I don't know about it. I wouldn't say that we had not missed one, but it has certainly been our policy.

Mr. KLEINFELD. That is the general policy?

Dr. GRIFFIN. That is right.

Mr. KLEINFELD. There may have been some exceptions?

Dr. GRIFFIN. There may have been.

Mr. KLEINFELD. I think we asked you this question before, but I would like to ask you again. Who assumes the final responsibility for the decision as to whether an economic poison is safe as far as the public is concerned?

Dr. GRIFFIN. Under the law the final authority for registration is in the Department of Agriculture, the Secretary of Agriculture.

Mr. KLEINFELD. And Congress has also authorized the Food and Drug Administration to establish tolerances for spray residues, is that correct?

Dr. GRIFFIN. That is correct.

Mr. KLEINFELD. I would like your opinion as to whether it would be a fairly logical division of authority to have decisions relating to the safety of an insecticide made by the Food and Drug Administration, and all others by the Department of Agriculture?

Dr. GRIFFIN. I might say that Food and Drug is interested in certain types of safety. It is less interested in other types of safety. May I give an example of parathion. Parathion is, from the Food and Drug Administration's standpoint, a comparatively safe thing, because when it comes in contact with foods it breaks down in a reasonably short period of time, and they have raised comparatively little question on the use of parathion. On the other hand, parathion, to the person that is applying it, is an extremely dangerous thing, probably as dangerous as any that we have at the present time. It is one of the things which has actually caused several deaths. From

that standpoint the Public Health Service is much more interested. The investigations which have been made by medical officers of these things have been made by Public Health Service rather than by Food and Drug Administration. So I would answer your question that certainly the Food and Drug Administration doesn't have in its interest the whole question even of safety.

Mr. KLEINFELD. I see. Well, let's look at it this way: Both the Public Health Service and the Food and Drug Administration are in the Federal Security Agency?

Dr. GRIFFIN. That is right.

Mr. KLEINFELD. Apparently the Public Health Service is more directly concerned with the safety of an economic poison as far as the handler or applier is concerned. Apparently, also, the Food and Drug Administration is concerned with the ultimate consumer, with the effect of any residues upon the health of the ultimate consumer. And apparently the Department of Agriculture is primarily interested in the efficacy of the economic poison and its advertising and labeling. Is that the line of demarcation?

Dr. GRIFFIN. I don't think so. I think the Department of Agriculture is very much interested in the safety of the material. I think it is very much interested in the fact that the products of agriculture shall be safe for use, and that there shall be a sale for them. There will be no sale whatever if they are not safe for use.

Mr. KLEINFELD. Isn't there then a duplication of functions as far as safety is concerned?

Dr. GRIFFIN. I don't think that in actual practice there has been any duplication of work. We do not go into the market to collect products to determine spray residues on them, collect food to determine spray residues on them. That is the function of the Food and Drug Administration, and we don't duplicate it. On the other hand, so far as I know, they do not collect samples of insecticides, fungicides, other economic poisons from the markets to analyze them to see whether they are what they are claimed to be, or to see whether their labeling is the correct labeling. I think that there is little, if any, duplication. I think the cooperation between ourselves and the Food and Drug Administration has been good, and I think it has been getting good results. As I said in my statement, I fully believe the increase in safety to the American public since the passage of our 1947 act has been greater than it has been at any other time.

Mr. KLEINFELD. Does your Department have existing facilities which are adequate, in your opinion, to go into the question of safety as far as the consumer is concerned?

Dr. GRIFFIN. We do not have sufficient pharmacological laboratories to make all necessary tests. We do not want to duplicate the work which is being done in other governmental laboratories. And when it comes to a question of residues in foods we are dependent on the Food and Drug Administration.

When it comes to certain other types of dangers we are dependent on the Public Health Service. We work very closely with the Public Health Service. Also Mr. Ward is on the advisory committee of their Savannah Laboratory, so that we know what is happening there and they are very cooperative.

Mr. KLEINFELD. Then you think that the present split of authority is probably the preferable division of authority?

Dr. GRIFFIN. I think it is the logical thing; yes. I might say that, as you know, we were in Food and Drug Administration, working with them, from about 1911 when the law was enacted until 1940, and after all, Food and Drug Administration set up a separate division to handle the control of insecticides and fungicides. I think it is a very logical separation.

Mr. KLEINFELD. Dr. Griffin, do you know whether borax or boric acid is presently registered under the Insecticide Act for use on foods?

Dr. GRIFFIN. I don't know of any case where it is registered for use on foods, no.

Mr. KLEINFELD. Either as an insecticide or fungicide?

Dr. GRIFFIN. I am inclined to think that there was one mixture—I would have to check up on it—which contains boric acid, which we went back to Food and Drug with. Mr. Ward, perhaps, can tell more about that. There was an antiskipper type of thing which, I believe, was registered after contact with Food and Drug on it. Now I can check on that and give the committee full information if they desire it.

Mr. KLEINFELD. Yes; I would, because Dr. Lehman, Director of the Division of Pharmacology of the Food and Drug Administration, told the committee, last year I believe, that in the opinion of the Food and Drug Administration both borax and boric acid were considered poisonous substances, poisonous per se, and should not be used on food products. Could you check that and tell us about it?

Dr. GRIFFIN. I will check on it.

Mr. KLEINFELD. Thank you.

Mr. ABERNETHY. Mr. Kleinfeld, let me suggest that his statement on that go into the record at this point so that it will come in at the proper order.

Mr. KLEINFELD. Yes.

Mr. ABERNETHY. As his answer to this particular question.

Mr. KLEINFELD. Yes.

(The statement referred to its as follows:)

UNITED STATES DEPARTMENT OF AGRICULTURE,
PRODUCTION AND MARKETING ADMINISTRATION,
LIVESTOCK BRANCH,
Washington, D. C., October 18, 1951.

Mr. VINCENT A. KLEINFELD,
Chief Counsel, Select Committee of the House of Representatives To Investigate the Use of Chemicals in Food Products, Washington, D. C.

DEAR MR. KLEINFELD: At the hearing before the Select Committee of the House of Representatives To Investigate the Use of Chemicals in Food Products on October 9, 1951, you asked whether boric acid, or borax, and diphenyl had been registered under the Federal Insecticide, Fungicide, and Rodenticide Act, for uses in connection with foods.

We are unable to find any record of the registration under the Federal Insecticide, Fungicide, and Rodenticide Act of either boric acid, borax, or diphenyl for food uses. One registrant suggested the use of borax in a product intended to control skippers in cured meat. He was told that such action would be objectionable under the Federal Food, Drug and Cosmetic Act, and his product does not contain this ingredient. There were a number of products containing borax or boric acid which were intended for roach control. These, however, were not intended for use in such a way that they will contaminate foods.

A paper containing diphenyl and intended for use as a citrus wrap has been offered for registration. Advice of the Food and Drug Administration was requested, and the manufacturer has been asked to furnish data on absorption of diphenyl by the citrus peel or oil. The product has not been registered.

We hope that the above information satisfactorily fulfills your request, but if there is anything further we will be glad to hear from you.

Very truly yours,

E. L. GRIFFIN,
Assistant Chief, Insecticide Division.

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE TO INVESTIGATE THE USE
OF CHEMICALS IN FOOD PRODUCTS,
Washington, D. C., October 25, 1951.

Dr. E. L. GRIFFIN,
Assistant Chief, Insecticide Division, Livestock Branch,
Production and Marketing Administration,
Department of Agriculture, Washington, D. C.

DEAR DR. GRIFFIN: I have your letter of October 18, 1951, in which you state that you were unable to find any record of the registration under the Federal Insecticide, Fungicide, and Rodenticide Act of boric acid, borax, or diphenyl for food use.

During the course of its hearings, this committee was advised (1) that diphenyl has been used widely during the last few years to impregnate wrappers for fresh fruit for the purpose of inhibiting the growth of bacteria and fungi on the surface of the fruits and to prevent their spread from one fruit to another, and (2) that diphenyl from these wrappers may be transferred to the fruit. It is the committee's understanding that such wrappers have been and are in use, and Dr. John R. Magness, of your department, in testifying before this committee, pointed out that paper impregnated with diphenyl is extensively used in packing citrus fruits for the purpose of preventing the growth of blue and green mold and stem and rot fungi. It is not clear, therefore, why diphenyl has not been registered under the act; and I shall appreciate receiving your comments.

Sincerely yours,

VINCENT A. KLEINFELD, *Chief Counsel.*

UNITED STATES DEPARTMENT OF AGRICULTURE,
PRODUCTION AND MARKETING ADMINISTRATION,
Washington, D. C., November 8, 1951.

Hon. JAMES J. DELANEY,
Chairman, Select Committee To Investigate the
Use of Chemicals in Food Products,
House of Representatives, Washington, D. C.

DEAR MR. DELANEY: This is in reply to the letter of October 25, 1951, from Mr. Kleinfeld, chief counsel of your committee, to Dr. E. L. Griffin, of this Administration, relative to fruit wraps impregnated with diphenyl.

As stated by Dr. Magness, diphenyl is extensively used for impregnation of wrappers, box liners, and layer sheets for citrus fruit. The best available information is that the treatment is not used to any considerable extent in California; that a little of it is used in Texas, and that last year about 650,000 boxes, or 1 to 2 percent, of the total crop in Florida was packed using diphenyl either in wrappers, layer sheets, or box liners.

The investigators in our Insecticide Division obtain samples of economic poisons from the open market, visiting places where such products are sold and distributed. They are able to sample only about 2,000 to 2,500 products a year, or less than one-tenth of the total number of the products on the market. No samples of diphenyl-treated paper have been obtained, probably because they are marketed in channels outside of the usual economic-poison fields.

Our investigators are being instructed to obtain samples of the treated wrappers if they are found in interstate commerce.

As we previously stated to you, we are unable to find any record of registration under the Federal Insecticide, Fungicide, and Rodenticide Act of diphenyl for food use. However, on August 1, 1951, a proposed label for diphenyl-impregnated citrus wrappers was submitted to us for registration. With it was submitted a progress report from the Stanford Research Institute on the toxicity of the product. In reply we wrote the firm on August 16 as follows:

"Due to the nature of the product and the possible absorption of diphenyl in significant amounts in citrus peel or oil, please furnish us with the results of any analyses which you have run. In doing so, please give the accuracy limits of the methods used."

At the same time we submitted a copy of the proposed label and progress report to the Food and Drug Administration for any available information on possible food contamination. Their report was as follows:

"We have been aware of the rather extensive investigation being conducted on diphenyl by Stanford Research Institute, and we hesitate to offer any authoritative comment until this work has been completed and the data carefully evaluated. As far as it goes, the available evidence does not provide a basis for our conclusion that the use of these diphenyl-impregnated wraps constitutes an adulteration under the Federal Food, Drug, and Cosmetic Act, but we have advised inquirers that any such use must be on the responsibility of the shipper of the wrapped product. We have, however, stated that where the diphenyl wraps are used there should be printed on each one a clear-cut statement to the effect that the diphenyl has been added as a chemical preservative. We do not believe that the 'diphenyl-protected' serves this purpose."

The manufacturer has been informed that further action toward registration will await submission of added data from Stanford and the results of chemical tests which the company may have undertaken.

Comment on the limitations of the application of the act to this material may be appropriate. Diphenyl is a common chemical sold for purposes other than as an economic poison. While we are not familiar with the method of its impregnation into paper, this is probably a manufacturing process and the diphenyl itself would not be considered an economic poison under the law. The treated paper before being placed on the fruit would be an economic poison, and if it was manufactured in a State other than that in which it was used to pack fruit, it would be subject to the law. If it was manufactured and used in the same State, it would not come within the scope of the law. The fruit bearing the treated wrapper would not appear to be an economic poison within the meaning of the law, but would be a food subject to regulations under the Food, Drug and Cosmetic Act. Our act would, therefore, apply only to the paper wrap from the time it was impregnated with the diphenyl until the wrap was applied to the fruit.

Sincerely yours,

HAROLD K. HILL,
Acting Administrator.

Mr. KLEINFELD. Dr. Griffin, do you know whether sodium orthophenylphenate is presently registered under the Insecticide Act?

Dr. GRIFFIN. I am sure it is registered for certain disinfectant purposes; yes.

Mr. KLEINFELD. What purposes; do you know?

Dr. GRIFFIN. I cannot recall specific properties. I do know that orthophenyl phenate is used and recommended as a disinfectant, I believe, particularly in cases where tuberculosis germs are present. I don't know of any use of orthophenyl phenate that is registered in connection with foods.

Mr. KLEINFELD. Would you say it was registered for use as a fungicide?

Dr. GRIFFIN. As a disinfectant.

Mr. KLEINFELD. That would be a fungicide; would it not?

Dr. GRIFFIN. That is right.

Mr. KLEINFELD. Your position and that of Dr. Lehman may not be inconsistent, but he stated before this committee, on page 386 of last year's hearings, that the present conclusion of the Food and Drug Administration is that at the present time there is not quite enough data to support proof of safety of the product for its proposed use as a fungicide.

Dr. GRIFFIN. I don't know what use he was referring to. I do know that orthophenyl phenate, the orthophenyl phenol sodium salt, has

been used as a disinfectant for at least 20 years. It is an old, old usage.

Mr. KLEINFELD. Well, that doesn't necessarily mean that it is unobjectionable; does it?

Dr. GRIFFIN. No. It would put it, however, in the class that I have mentioned where it was an old usage, and we have gone along with old usages that appeared from use experience to be safe.

Mr. KLEINFELD. I see. Do you know whether diphenyl is presently registered under the Insecticide Act for use on or in foods?

Dr. GRIFFIN. I can't tell you offhand. There has been some suggestion of diphenyl as used in wrapping papers for fruits, but whether it has been registered or not I can't tell you.

Mr. KLEINFELD. Could you find out and advise the committee?

Dr. GRIFFIN. I can.

Mr. KLEINFELD. Because Dr. Lehman stated before this committee that diphenyl is a chemical which is used as a fungistatic agent and that, in the opinion of the Food and Drug Administration, it should not be used since there has been, according to him, a lack of adequate study on it.

Dr. GRIFFIN. I might say that the usage I have heard suggested for that is impregnated in paper, and it isn't put except as a paper wrap on the fruit. It isn't put directly on the fruit.

Mr. KLEINFELD. Doesn't that, in your opinion, raise some question, however, of absorption?

Dr. GRIFFIN. There is a possibility of absorption. I don't know about that.

Mr. KLEINFELD. Do you know offhand whether dehydroacetic acid has been registered under the Insecticide Act?

Dr. GRIFFIN. To the best of my knowledge, not.

Mr. KLEINFELD. Do you know if it is used at all as an insecticide or fungicide?

Dr. GRIFFIN. I don't know of any use for it.

Mr. KLEINFELD. I think I mentioned when you were here last time, Dr. Griffin, that Dr. Lehman of the Food and Drug Administration advised this committee fairly recently that, in his opinion, chlordane is one of the most toxic of insecticides we have to deal with, and that it was a poison of such magnitude that its use should not be permitted where there was even the remotest possibility of food contamination. Has chlordane been permitted registration under the Insecticide Act?

Dr. GRIFFIN. Chlordane has been permitted registration for a number of purposes; yes.

Mr. KLEINFELD. What purposes?

Dr. GRIFFIN. Chlordane has been permitted for certain uses against roaches. Possibly we should submit a copy of Interpretation No. 19, which was issued on September 15 relative to use of chlordane.

Mr. KLEINFELD. September 15 of what year?

Dr. GRIFFIN. This year. Relative to uses of chlordane against such insects as roaches, ants, and silverfish. Here is a copy of it [handing document to Mr. Kleinfeld].

Mr. KLEINFELD. Briefly, would you tell the committee what uses it was approved for?

Dr. GRIFFIN. It is not approved for use in large areas in households or where people dwell continuously. It is permitted as spot application for roaches, ants, in households. It is permitted for industrial use. It is permitted in a number of agricultural uses—soil applica-

tion for lawns. It is permitted for cotton, for fruits of some sort where the application is 60 days before harvest. Do you wish to go over a complete list?

Mr. KLEINFELD. Just mention some of the agricultural uses for which it is permitted by your Department—the major agricultural uses.

Dr. GRIFFIN. It is allowed on peaches and apricots but not within 30 days of harvest. It is allowed on strawberries but not after the berries begin to form.

It should not be used on cucumbers, squash, and other cucurbitaceae, because it is injurious.

Mr. BILLINGS. Injurious to the plant.

Mr. KLEINFELD. Beg pardon?

Mr. BILLINGS. Injurious to the plant in this case.

Mr. KLEINFELD. Yes.

Dr. GRIFFIN. It is permitted on potatoes where it does not reach the potato itself. It is permitted on tomatoes but not after the fruit begins to form. For onion thrips, that is, on dry onions, not the green onions. Carrot rust fly, onion and cabbage maggots. It is applied to the plants as soon as they are set, and when the plants are an inch high. Those, I think, are the principal uses—cotton in addition.

Dr. MILLER. Mr. Kleinfeld, I would like to ask the doctor a question there.

Mr. KLEINFELD. Yes, sir.

Dr. MILLER. You say "permitted to be used." That is on commercial crops that might go into markets, I presume?

Dr. GRIFFIN. When I say "permitted to be used," I mean permitted to make label statements. Of course, we do not maintain any police to actually police the gardens or police the fruit and truck farms.

Dr. MILLER. As a matter of fact, since chlordane can be bought in drug or hardware stores or garden supply houses, there is nothing to prevent Mrs. Smith, who is raising quite a little garden for herself and maybe her neighbors, from using chlordane on strawberries and on apples and peaches and other garden products right up to the day before they are put on the table.

Dr. GRIFFIN. That is correct. Certainly, though, if we allowed only insecticides which were absolutely safe up to the day that you put the things on the table we would have no crop protection.

Dr. MILLER. How do you arrive at the 30-day period in relation to apples, peaches, and so forth?

Dr. GRIFFIN. May I say that chlordane was one of the products which was in use before our act came into effect, that the use of chlordane is recommended by State agricultural experiment stations, and I believe that 30 days is in line with what has been considered safe usage. Have you anything to add, Mr. Billings?

Mr. BILLINGS. No, I don't think I have anything to add to that. The 30-day limitation has been felt to be safe and to leave no residues. Incidentally, we have not accepted its use on apples. The only use where that applies would be peaches and apricots.

Dr. MILLER. Well, in connection with the selling of this product in drug stores and other places where it is obtainable, do you require that the people who label the material put some instructions on the labels as to its safe use upon strawberries, for instance?

Dr. GRIFFIN. We would require that any directions for use in connection with strawberries would say "Do not use after the berries begin to form."

Dr. MILLER. You require those instructions?

Dr. GRIFFIN. That is right.

Dr. MILLER. So if the individual buys it, uses it and reads the label, he is doing it with his eyes open?

Dr. GRIFFIN. And we think he is having a safe usage.

Dr. MILLER. Do you think if it is used on strawberries when they are ripe and picked the same day, that if they are taken into the kitchen and washed thoroughly it can be washed off?

Dr. GRIFFIN. We certainly wouldn't want to recommend that. In other words, we think you ought to keep away from them after the berries have begun to form.

Dr. MILLER. What would happen to an individual who got chlordane in food?

Dr. GRIFFIN. Well, Mr. Ward, that is more in your field.

Mr. WARD. It would depend on the amount which was eaten. Dosages which are injurious would have to be considered. I couldn't forecast from what a person would eat on a single dish of strawberries, for example, that any symptoms would be apt to develop. As Dr. Lehman has discussed before your committee, the major problem with chlordane is chronic poisoning, repeated dosages, and as a consequence, I would hate to forecast any injury from the consumption of a single dish of strawberries so treated.

Dr. MILLER. But it is being used pretty freely by the gardener, and I think possibly without enough attention to these facts.

The other point I had in mind—I think the last one, Mr. Kleinfeld, and the gentleman may not be in a position to answer it, is this. It occurs to me that in connection with wells on farms or the area of the city water supply where there is a reservoir, that when the rains come these economic poisons, lead arsenate, and all the forms of arsenate, and chlordane might be flushed down into the reservoir or into the well, so that there might be quite a problem as to how much poison gets into this water. Have you any study on that or have you given any thought to it?

Dr. GRIFFIN. Well, we have had two cases where that problem has come up. One of them was in the South where aldrin was used on cotton to a large extent, and there were rains which washed the aldrin into streams, and there was some killing of fish in the streams. The Public Health Service made a study of the problem there, and their findings were that the water supplies were not in danger. There was also a case where livestock people in California used rotenone as a cattle grub remedy, and some of the residues of the rotenone got into the streams and again fish were killed. Rotenone, however, is not so serious from a human toxicity standpoint as aldrin would be.

Mr. ABERNETHY. Let me ask one question there.

Mr. KLEINFELD. Yes, sir.

Mr. ABERNETHY. Going back to the labelling of chlordane—is there a standard label that all dispensers of the material must use in dispensing or distributing this material?

Dr. GRIFFIN. There is not a complete standard label. Our law does not provide for setting up complete standard labels. We have, however, standard precautionary statements, precautions that you

should take in handling the matter, and that appears in the standard form on practically all labels.

Mr. ABERNETHY. Now let's go back to the manufacturer when he ships it out. Do they have a standard label on the container? We will say it comes out in bulk from the plant. Do they have a standard label of some kind warning that use of it in the field of agriculture or some other activity is inadvisable?

Dr. GRIFFIN. I do not believe that the label for chlordane, for example, which is a liquid, bears the statement of all the uses for which chlordane is applicable and those for which it is not applicable. But it is my understanding that the manufacturer does give that sort of advice to the formulators.

Mr. ABERNETHY. All right. You say it is permitted on peaches and apricots. Now when the farmer purchases it is the seller required to label the chlordane accordingly, that is, as you have just stated? How does he know?

Dr. GRIFFIN. A farmer, as far as I know, never purchases pure chlordane. The farmer purchases a formulated material. The formulated material must be properly labeled and registered.

Mr. ABERNETHY. He purchases a material which includes chlordane?

Dr. GRIFFIN. That is right.

Mr. ABERNETHY. That is used for a particular purpose?

Dr. GRIFFIN. That is right.

Mr. ABERNETHY. And the manufacturer is required to put a label on the package?

Dr. GRIFFIN. That is correct.

Mr. ABERNETHY. Advising the quantities that it may be used in and where it should not be used and so forth?

Dr. GRIFFIN. Well, of course, we can't go over and say on each one of the things that it should not be used on. Those are myriad. We give the statements of the things that it is to be used on and the directions for how it shall be used.

Mr. ABERNETHY. How does the farmer ordinarily come to use it? Is it not on advice of the county agricultural authorities?

Dr. GRIFFIN. I think that is very largely the case at the present time, and, of course, the agricultural agents are aware of what are proper usages.

Mr. ABERNETHY. That is right.

Mr. HORAN. May I ask a question there?

Mr. ABERNETHY. Mr. Horan.

Mr. HORAN. How many certified cases of death can you in your experience since 1913—and I want to pay you tribute for your service in the Department of Agriculture which I think has been outstanding—how many cases of certified death can be attributed to pesticides in your experience in the Department dating back to as far as 1913?

Dr. GRIFFIN. I can't make a definite estimate of that sort. There are, perhaps six or eight deaths a year from accidentally drinking nicotine.

Mr. HORAN. They have been certified so you can testify as a certainty?

Dr. GRIFFIN. I say nicotine alone caused six to eight. I could be perhaps a little bit more definite if I know what you want. I know of not more than half a dozen deaths of economic poison in use of

agriculture where the death has been caused by ordinary types of use of the material. Now nicotine lies around in the household and the kid picks it up and drinks it, and that is an accident which labeling won't cure. There have been other deaths from arsenic, where people have taken it with suicidal intent.

Mr. HORAN. You are talking about arsenic, not arsenate of lead?

Dr. GRIFFIN. I am not talking about arsenate lead. I believe there was one case of a death from calcium arsenate where, before labeling was required, somebody put a bag of calcium arsenate in their pantry and the wife picked it up and used it for flour.

Mr. ABERNETHY. Permit me to interrupt. I don't think that is what Mr. Horan is driving at.

Mr. HORAN. No.

Mr. ABERNETHY. I think he wants to confine it to——

Mr. HORAN. Their regular use.

Dr. GRIFFIN. I can't give you that information.

Mr. HORAN. Are there any to your knowledge?

Dr. GRIFFIN. There have been three deaths, I believe, from parathion where the people were applying it.

Mr. HORAN. That is right, but that was the fault of the applicator.

Dr. GRIFFIN. That is right.

Mr. HORAN. He failed to use the precautions that the county agents and the representatives of the responsible chemical companies advised him to use.

Dr. GRIFFIN. I know of no deaths from foods which have been treated in the ordinary manner with insecticides.

Mr. HORAN. This committee, I am sure, is interested in this factor, Dr. Griffin, and I think it is pertinent. I think it justifies our investigation.

Probably you would say that in any well-organized productive industry—such as exist in my home district—we are almost a big business within our community. Every morning on the radio during the season of production we have frost warnings, we have reports on the coddling moth catch, and we have talks by the county agents and others, as the next witness could very well testify because he lived there among us for a long time. You definitely do not have the problem in such a well-organized industry where people know what they are doing as you would have in the field that Dr. Miller was questioning you about, the incidental gardener or the patchwork productive area where insecticides might be used by those who didn't have the advantages of what you might almost call collective knowledge. Isn't that so?

Dr. GRIFFIN. There is a decided difference, and we have in certain cases made differences in label requirements. For example, there are certain cases where we have stated that this material may be labeled for use only with air or power ground applicators; in other words, cutting out the small user with the little knapsack sprayer who might get it all over himself and who would not be properly warned as to precautions to use.

Mr. HORAN. That is all, Mr. Chairman.

Mr. ABERNETHY. All right, Mr. Kleinfeld.

Mr. KLEINFELD. I have a publication here, Farmers' Bulletin No. 2009, United States Department of Agriculture, entitled "Storage

of Small Grains and Shelled Corn on the Farm." It was issued in September of 1949. Are you familiar with that, Dr. Griffin?

Dr. GRIFFIN. I am not familiar with that; no.

Mr. KLEINFELD. Well, on page 24 of that booklet of the Department of Agriculture the statement is made that "Sprays that have been found satisfactory for treating bins consist of 2.5 percent by weight of DDT, TDE, methoxychlor, or chlordane as emulsions or water suspensions" and so forth. So apparently it is recommended for use in the treatment of storage bins for such grains as shelled corn; is that correct?

Dr. GRIFFIN. That is possible.

Mr. KLEINFELD. And your Department has recommended chlordane for fly control in barns and other places on the farm, except inside dairy barns and milk rooms. That is correct, is it not?

Dr. GRIFFIN. I would presume it might be. Do you have any information on that, Mr. Billings?

Mr. KLEINFELD. That recommendation was made in leaflet No. 283 of the Bureau of Entomology and Plant Quarantine, entitled "Fly Control on Dairy Cattle and in Dairy Barns." I questioned you on that last year.

Dr. GRIFFIN. Yes.

Mr. KLEINFELD. I assume it is still the position of the Department.

Dr. GRIFFIN. I cannot tell you what the recommendations are. We do not make recommendations.

Mr. KLEINFELD. Then from what you said about the uses for which chlordane is recommended or permitted, are you in agreement or disagreement with the position taken by Dr. Lehman that chlordane should not be permitted where there is even the remotest possibility of food contamination?

Dr. GRIFFIN. We certainly don't want food contaminated with chlordane, and in all of our directions we have attempted to prevent food contamination with chlordane. I might say in interpretation No. 19, which I handed you, it was taken over to the Food and Drug Administration and was agreed to by them before it was put out.

Mr. KLEINFELD. That was issued this month, was it not?

Dr. GRIFFIN. That was issued September 15.

Mr. KLEINFELD. Well, would you still recommend chlordane for use in storage bins for grains?

Mr. BILLINGS. If such a label came in it would be turned down immediately.

Mr. KLEINFELD. Pardon me?

Mr. BILLINGS. If such a label came in it would be turned down immediately.

Mr. KLEINFELD. Then I don't quite follow the recommendation of this bulletin.

Mr. BILLINGS. You will have to ask the Bureau of Entomology about that.

Mr. KLEINFELD. Well, this bulletin, according to footnote 1 on page 1, says:

This bulletin was prepared by C. K. Shedd, senior agricultural engineer, Bureau of Plant Industry, Soils, and Agricultural Engineering, and R. T. Cotton, senior entomologist, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, in consultation with other representatives of their bureaus and the Grain Branch, Production and Marketing Administration, of the United States Department of Agriculture.

Are you not part of the Production and Marketing Administration?

Dr. GRIFFIN. We are in the Production and Marketing Administration. May I say again—you stated that the date of that was 1949. There has been a difference in feeling. Dr. Lehman himself indicated that his views had changed.

Mr. KLEINFELD. I see. What are your present views?

Dr. GRIFFIN. Mr. Billings, who is in charge of claims of that sort, has just stated that we do not register products for that use at the present time.

Mr. BILLINGS. That is very definite, too.

Mr. KLEINFELD. Pardon me?

Mr. BILLINGS. That is very definite, too. If a thing like that came in, it would be immediately turned down.

Mr. KLEINFELD. Turned down for use in storage bins?

Mr. BILLINGS. Yes, sir.

Mr. KLEINFELD. Do you know whether any publication has been issued which changes the recommendation made here?

Mr BILLINGS. I don't know.

Mr. ABERNETHY. May I interrupt you there, Mr. Kleinfeld?

Mr. KLEINFELD. Yes, sir.

Mr. ABERNETHY As I understand, that bulletin issued by the Department of Agriculture recommends the use of this chlordane in storage bins for small grains.

Mr. KLEINFELD. Yes.

Mr. ABERNETHY. Now that raises a very interesting question. I would think that, when bulletins of this kind are issued recommending the use of a particular chemical, certainly before being issued, it should be cleared with your Department, Doctor.

Mr. WARD. They are now.

Mr. ABERNETHY. They are now?

Mr. WARD. That is right. We had numerous conferences within the last several months.

Mr. ABERNETHY. I wonder if this bulletin has been withdrawn.

Mr. WARD. Not to my knowledge.

Mr. KLEINFELD. I might say, Mr. Abernethy, that we asked for a copy and received this copy only within the last few months, May or June of this year. So apparently it is still current.

Mr. ABERNETHY. Have you checked to determine whether or not it is still carried on their official list of bulletins distributed annually by the Department of Agriculture?

Mr. KLEINFELD. No; we only checked in asking for a copy in May or June of this year.

Mr. ABERNETHY. I wish you would make some inquiry about that.

Mr. KLEINFELD. I would be very happy to.

Mr. ABERNETHY. All right.

(On October 16, 1951, it was ascertained that the bulletin had not been withdrawn and is still currently distributed by the Department of Agriculture.)

Mr. KLEINFELD. Dr. Griffin, has dinitro-ortho-cresol been permitted registration for use as an insecticide?

Dr. GRIFFIN. I have no doubt but that it has.

Mr. BILLINGS. It is accepted for use only as a dormant spray. That is, in the winter months it is very phytotoxic and would be highly injurious if applied during the growing season. If it is applied in

wintertime it is a valuable insecticide for killing mites and mite eggs.

Mr. KLEINFELD. In the dormant season?

Mr. BILLINGS. In the dormant season.

Mr. KLEINFELD. In connection with the list of chemicals submitted to this committee by the Food and Drug Administration and the Public Health Service, there is a statement which was made before this committee, and I quote:

> This is one of several of the so-called dinitro compounds. All of the dinitro compounds are metabolic stimulants. They may also produce cataracts. This group of insecticides, therefore, presents a potentially severe public health hazard.

Do you believe that when used in dormant seasons, as you mentioned, dinitro-ortho-cresol wouldn't present any health hazard?

Mr. BILLINGS. I am the entomologist. You will have to ask somebody else on that.

Dr. GRIFFIN. I think we are safe in saying it would not produce health hazards to the people that ate the fruit. Now the people who applied the material certainly have to be protected.

Mr. KLEINFELD. Dr. Griffin, is selenium registered under the act?

Dr. GRIFFIN. Selenium is registered under the act for certain purposes; yes.

Mr. KLEINFELD. It has been used as an insecticide?

Dr. GRIFFIN. Yes.

Mr. KLEINFELD. Now this is another insecticide where apparently there seems to be some difference of opinion between you gentlemen and the Food and Drug Administration, and I am a little puzzled by it. For example, Dr. Lehman testified before this committee that the Food and Drug Administration was of the opinion that selenium should not be used as an insecticide; he made a flat, categorical statement to that effect. He said he had found that the use of very small amounts in the diet, about three parts per million, would produce cirrhosis of the liver and cancer of the liver. He testified that, for example, selenium will penetrate the skin of an apple and appear in the pulp; that it builds up in the soil; and that selenium can migrate from the soil into the growing plant and eventually appear in the fruit. If that experimental work is correct, should selenium be permitted for use as an insecticide?

Dr. GRIFFIN. You asked me whether selenium had been used as an insecticide. Dr. Lehman has made a statement there, and I presume in making that statement he only intended to refer to the use of selenium in connection with foods. We have two uses of selenium registered. One is for use in connection with ornamental plants, particularly in greenhouses, where there is no chance of contaminating foods. I presume Dr. Lehman's statement would not refer to that usage. The other usage is for certain specific fruits in California. That use is one which has been going on for at least a dozen years. The earth under the fruit trees and the fruits have been analyzed and tested at the University of California. The State of California has registered it for this use, and so far as we are aware there has been no dangerous residue of selenium shown in the fruits produced by such use.

Again I might say that the soils on which a selenium insecticide are used have a very great bearing on whether or not selenium will go into

the fruit. There are natural selenium soils over large areas of the country where products are being grown. In the particular soils which were involved in California there appeared to be no danger. The company who is putting out this product wanted to extend the usage to Florida, but in the absence of any thorough investigation of the soils, of the situations as they occurred in growing there, we have refused to register it for use in Florida.

Mr. KLEINFELD. But, according to the Food and Drug Administration and other sources of information, selenium does build up in the soil, does it not?

Dr. GRIFFIN. Selenium builds up in the soil and becomes locked up in soil compounds. Selenium in one soil will act quite different from selenium in another soil.

Mr. KLEINFELD. I do not know, of course, whether the committee is qualified to determine which group is correct, but there has been a difference of opinion between you gentlemen and the Food and Drug Administration on selenium. Is that not correct?

Dr. GRIFFIN. I think that the Food and Drug would have rather had selenium entirely denied use in California, but again that was an old use which was in practice long before the new law was passed, and we have not felt that we had sufficient information to justify breaking it up.

Mr. KLEINFELD. If there is a doubt, how would you resolve it?

Dr. GRIFFIN. On the things where there has been long and safe usage we have to take that into account. We have heard of no cases where the Food and Drug Administration has felt that there was so much selenium in citrus that it was necessary to take the material off the market. We have, so far as we have been able to discover, safe usage in that particular way.

Mr. KLEINFELD. At the hearings last year before this committee, on pages 409 to 411, the Food and Drug Administration submitted testimony in a memorandum concerning selocide, a selenium compound. Here in part is what they said on pages 410 and 411:

On August 24, 1948, Food and Drug Inspector A. N. Morton reported to the chief of our Seattle station that "During the past year McLaughlin Gormley King Co., of Minneapolis, has continued to advertise selocide as a spray material for apples and pears in the trade publications and the newspapers in Yakima and Wenatchee. Appreciable quantities of the material have been used in both areas during the 1948 growing season."

On December 2, 1948, Mr. J. C. Ward—

that is you, sir?

Mr. WARD. That is right.

Mr. KLEINFELD (continuing):

of the Insecticide Division, PMA, USDA, told us that he was familiar with our views on selocide and consequently he had been delaying registration of this product, but that he did not believe the action could be denied unless there was clear-cut evidence demonstrating that fruit grown in areas where selenium sprays have been used do have significant amounts of selenium taken up from the soil. We told him that we did not have any authentic data to add to the article in the November 1946 Journal of the Association of Official Agricultural Chemists, with which he was already familiar, and Mr. Ward said that it looked like Agriculture would have to register selocide for use in one or two sections of California with the understanding that if additional evidence warranting such a course is acquired these registrations can be canceled.

Does that not indicate that no matter who was right or wrong there was apparently some doubt and a difference of opinion as to whether selenium should be used?

Dr. GRIFFIN. I have said that we have had to treat the older products that had been on the market before the law was passed differently from the new ones. I have a feeling that if selenium had come up as a new chemical after the law was passed and we were starting from the beginning on it that it probably would not have been registered.

Mr. KLEINFELD. Does the law make any such distinction?

Dr. GRIFFIN. The law does not make distinction, but there is a difference. There is a legislative history which, I think, indicates very thoroughly that we should not break up existing usage; we should not throw the market into a turmoil. I will say, if we went back to every insecticide which has been used for 30 years and tried to apply the same rules that we are applying to some of the new products now, it would be—well, it would be just as bad as the case of the residue hearings has been. It would be 10 years before we got anywhere.

Mr. KLEINFELD. Well, don't you have to take some steps?

Dr. GRIFFIN. We are taking steps on a number of things. As I have said in the case of selenium, what you read indicated it was being used in Washington and Oregon on apples and pears. Now it is not registered for use in Oregon and Washington, and so far as I am aware, in the last 2 or 3 years it has not been marketed in that area.

Mr. KLEINFELD. In other words, Dr. Griffin—and I say this not in any critical fashion—as far as the older insecticides are concerned, those in use when the Insecticide Act was passed, even though there may be some doubt in your mind or in the mind of the Food and Drug Administration as to their safety, nevertheless, they are continuing in use?

Dr. GRIFFIN. That is right, where we have felt there was a safe-use history.

Mr. KLEINFELD. Safe-use history meaning that you don't know of any deaths?

Dr. GRIFFIN. Meaning more than that—that we don't know of any residues which have caused any injury whatever. And, as I say, on the selocide, the California University people are very definite that their tests show that there is at least no appreciable amount of additional selenium in the fruits and vegetables. Do you have anything to add to that, Mr. Ward?

Mr. WARD. The committee might be interested in this additional work which was attempted by the Public Health Service at the time the selenium problem arose. Public Health crews were sent into the natural selenium areas of North and South Dakota, where wheat had been found to be contaminated, with a deliberate effort to find injury in humans living in that area and eating that wheat. Dr. Smith, who was the pharmacologist with that crew, was forced to admit, after having studied the situation extensively, that he was unable to pick up injury which he could assign directly to selenium exposure or ingestion. That had a bearing on our own thinking with regard to the California situation when the question was raised as to whether we had justification for canceling the use of selocide. There is an additional factor which should be considered, and that is that selocide is one of the selenium compounds which will disintegrate into an

unsoluble form of selenium which, according to our best information, is not readily ingested, not readily absorbed when ingested. And as a consequence we feel that the strict question as to selenium toxicity, which is based largely on the studies made with soluable selenium compounds, does not fully forecast the type of injury which would be caused by the ingestion of selocide or the decomposition products of that chemical.

Mr. HORAN. Might I ask there, who conducted these ingestion studies?

Mr. WARD. The work has been done by a number of investigators, among whom are a group in California, the investigators in Minnesota, Dr. Wright and his associates at the University of Minnesota. Much work was done by Dr. Cox of the State of California enforcement staff and his associates.

Mr. HORAN. This was done on human beings?

Mr. WARD. No; that is the basic work on the toxicity of the chemical. Now the ingestion work to which I have referred was basically the ingestion of contaminated food from naturally occurring selenium in the States of North and South Dakota, and observations were made on unintentional victims, if you will, people who had lived in the territory and had eaten bread from wheat which was known to be contaminated with selenium. There were no tests made on administered doses on humans. It was merely the taking advantage of the natural situation where it was known that these people were living in areas where livestock had died from the ingestion of poison weeds with selenium as a factor, and where it was hoped that we could pick up some sort of information from people living in the area. And it is that type of selenium exposure which the Public Health Service studied; Stohlman and M. I. Smith, of the National Institute of Health, were the two leaders during that particular investigation.

Mr. HORAN. Might I ask one question there?

Mr. KLEINFELD. Yes, sir.

Mr. HORAN. It might not be relevant. You mentioned poisonous or noxious weeds. Do I understand weeds like the Klamath weed and halogeton are apt to have high quantities of selenium in them?

Mr. WARD. From the natural occurring selenium, Mr. Horan. And I think you will find there are so-called accumulator plants, and some of the weeds which you named are capable of taking selenium from the soil. I do not know that any investigator has formed a firm opinion as to whether the naturally occurring poisonous glucosides or other phytotoxic materials in the plant contribute to the selenium poisoning, or whether the thing is the other way around. But we do know that livestock pastured on certain of those seleniferous areas and eating poison weeds are killed much more rapidly than they would be killed with the straight selenium poisoning, which leads us to believe that there is an interrelationship between the toxic poison which would occur in the plant by its growing on a normal soil and the toxicity of the material where selenium was a part of the plant composition, because of it being picked up from the soil.

Mr. HORAN. I want to make a mental note of that because we do know especially in the case of halogeton we have found a natural enemy. We do know a very few pounds of the foliage will kill a sheep on the range, but we have imported a beetle, I believe it is from Australia, and we have cleared a hundred square miles in northern

California—that was about 6 months ago and they probably have increased that—and the beetle kills the halogeton by eating the fruit of the halogeton plant, which is an interesting observation to me because in many cases we are talking about foliage and the other parts of the trees other than foliage, and, of course, the way the beetle kills the halogeton plant is by eating the seed which is the fruit of the halogeton plant. I think further studies along that line should be had, and I think they are on their way. I am sure we have research going on in that field. I am going to check on that.

Mr. KLEINFELD. Dr. Griffin, just a few more questions. On page 573 of the hearings this year you testified as follows:

> We do not feel that we are in a position to attack the residue and from the standpoint of testing foods and enforcing from the food standpoint. That is the Food and Drug Administration's field, and we feel that they are the ones who should make recommendations.

Do you still agree with that?

Dr. GRIFFIN. Certainly, from the residue standpoint the law gives them authority to make tolerances. We have no such authority.

Mr. KLEINFELD. And you said also that you do confer with Food and Drug?

Dr. GRIFFIN. That is right.

Mr. KLEINFELD. Well, apparently, as indicated by the selocide example, there are times when you differ; is that not correct?

Dr. GRIFFIN. There are times when we have felt that we didn't have authority to go quite as far as they would like to have us go.

Mr. KLEINFELD. So to that extent you do reach different conclusions and take different courses of action; is that correct?

Dr. GRIFFIN. Of course, you must realize that they have not set a tolerance for selenium. Now, if there was a tolerance there and we could say that these oranges which are being produced from selocide-treated trees are giving selenium content above the tolerances, we would feel on very firm ground in cutting it out.

Mr. KLEINFELD. Well, might it not be that it is the view of the Food and Drug Administration, and I so gather from the testimony, that selocide should not be used at all?

Dr. GRIFFIN. If they could set a zero tolerance, all well and good, we would, I feel, have firm ground to refuse registration if that was going to cause any selenium in the fruit whatever.

Mr. KLEINFELD. But supposing someone came in to see you today and said, "I want to use selocide." What would you do? Would the burden be on him to prove to you it was quite safe?

Dr. GRIFFIN. We would ask him first what use he wanted to make of it.

Mr. KLEINFELD. Let's say on apples and pears.

Dr. GRIFFIN. We would ask, second, where he was going to use it and what experimental work there was to justify the use.

Mr. KLEINFELD. All right. Would you clear it with Food and Drug?

Dr. GRIFFIN. We would clear that experimental work with Food and Drug.

Mr. KLEINFELD. Supposing Food and Drug said, as it apparently has said in the past, that the amount of selenium which is finding its way into the Nation's food supply as a result of such actions is probably insignificant at present, but may assume serious proportions

as the soil concentration builds up over the years. And they made other statements which I read to you before indicating, it seems to me, that they do not believe selenium should be used as it was used here.

Dr. GRIFFIN. As I have told you, we have limited the selenium use to those usages which were in effect for at least 10 or a dozen years before any registration was issued and where the analyses showed there was not any build-up. And so far as we have been able to find—well, I think I am correct in saying this—the products which are being grown on this soil contain far less selenium than products grown on natural selenium soils.

Mr. KLEINFELD. Maybe I am not making my point clear. I am not saying who is right or wrong. I am not qualified, of course. All I am saying is that apparently, as indicated in the testimony we got from Food and Drug appearing on pages 409 to 411 of last year's hearings, if they had to make the decision as to whether selocide, this selenium product, should have been used as it was proposed for use here, they would have said, "No," and you would have said, "Yes." That is what it amounts to; is it not?

Again I say I don't know who is correct; I am not qualified to make that determination, but there was a difference of opinion.

Dr. GRIFFIN. I think they would have said, "No." And as I said, I would like to make the distinction again between new products coming on the market and those that have had an established market. This had been established with a safe use before the registration came in.

Mr. KLEINFELD. One last question, sir. We have had testimony here before this committee—for example, from the counsel for the Grocery Manufacturers of America, and reports from some of the food canners—that apparently as far as they are concerned, at least, there is a serious insecticide or insecticide residue problem, notwithstanding the existence of the law as we have it now. For example, at the recent convention of the National Canners' Association held this year, an address was made by H. Thomas Austern, chief counsel for the association. This is what he said in part:

> Yet in a good number of instances many new substances were widely marketed and their use only later brought to light in standard-making proceedings. The fear existed—deeply felt by many and considered exaggerated by some—that error might mean, not necessarily a dramatic series of deaths from acute poisoning, but widespread public injury through the ingestion over long periods of time of materials of chronic or cumulative toxicity.

And he continues as follows:

> As I have repeatedly suggested, the burden on the responsible canner was onerous. He often did not know which of the many pesticides his grower might employ. In some instances, not only was knowledge of relative toxicity lacking but there was also no positive method for quantitative detection of possible residues. Yet the processor remained legally responsible and certainly answerable to the consumer for the finished product.

Now if that is correct, and apparently the National Canners' Association and Grocery Manufacturers of America have so testified, and various canners have so reported, there is an existing pesticide problem, is there not?

Dr. GRIFFIN. Oh, certainly. If there wasn't, we wouldn't be here.

Mr. KLEINFELD. How will you meet it? What are we going to do about it?

Dr. GRIFFIN. It must be met, as I see it, from two sides. The one side is that the products which are registered must be carefully screened before they are registered. We must be sure that there is labeling which will, if followed, give adequate protection for use.

Then after we have gone as far as we can from a label standpoint, certainly the Food and Drug Administration must go back and see that the products which are actually produced do have safe properties, to see that directions have been followed, to see that somebody hasn't had a bright idea and said, "This product is a good insecticide, so we will use it on our peaches or on our plums, or what have you, and it hasn't left residues that will do damage."

Now I might point to one very glaring example. That is the use of benzene hexachloride on potatoes and on peanuts. We have never registered benzine hexachloride for either of those uses. But there were people who had the bright idea it might be used, and you have probably heard in the hearings there have been fairly large amounts of potatoes which had to be condemned because they had off-flavors. So, as I say, there must be a follow-up on the foods themselves to determine that they are safe for market.

Mr. KLEINFELD. And I think you have said that you believe certain changes in existing law are necessary.

Dr. GRIFFIN. I have.

Mr. KLEINFELD. For example, acquiring information as to methods of analysis; is that right?

Dr. GRIFFIN. I think that is desirable.

Mr. KLEINFELD. I have no further questions.

Mr. ABERNETHY. Any questions, gentlemen?

Mr. HORAN. I would like to ask one question.

Mr. ABERNETHY. Mr. Horan.

Mr. HORAN. Not all, but most, I would say, of our fruits and vegetables are processed after they have removed the outside wrappings. That is true of cabbage, I think, and lettuce.

Dr. GRIFFIN. That is right.

Mr. HORAN. Have you made any studies to find out what the permeation is of these various pesticides?

Dr. GRIFFIN. There is a difference in pesticides. There are some of them which will do very little permeation which will be very little absorbed. There is another class which is being very strongly stressed at the present time, which goes directly into the plants' fluid and will kill insects sucking that fluid out of the plant. Now, of course, if you are going to use that variety of insecticide, it will go into the plant just as well on the outside. But some of the others, certainly taking off the outside does get rid of the insecticide. We have to consider each one separately.

Mr. HORAN. Isn't the expressed fear of Mr. Austern, the attorney for the National Canners' Association, based upon psychology and possible sales resistance rather than upon facts?

Dr. GRIFFIN. I am unable to comment on that. I am sorry.

Mr. HORAN. Well, you already told me there are no known deaths from that source.

Dr. GRIFFIN. I don't know of any known deaths, but I can guess that from a commercial stand point if benzene hexachloride, for example, which gives off-flavors, should get on one of their baby

foods—and those flavors develop more after the food had been processed and canned—and they should get a lot of that on the market, a year's production on the market, and it should begin to show up off-flavors, I imagine it would pretty nearly be commercial death.

Mr. HORAN. In the old days in the West, when temperatures got down around zero or 10 below, they used kerosene heaters; and, of course, they would impart this flavor to the apples in the storage room.

Dr. GRIFFIN. Yes.

Mr. HORAN. It was no danger to health, just a danger to the health of the pocketbook of the fellow that had the common storage plant.

Dr. GRIFFIN. That is right.

Mr. HORAN. There was nothing wrong with it. I suppose, if mineral oil is good for you, perhaps, that might be a worth-while additive to the fruit. [Laughter.]

Dr. GRIFFIN. That is right.

Mr. HORAN. That is all.

Mr. ABERNETHY. Dr. Miller.

Dr. MILLER. I wanted to ask one or two questions. Of course, part of this committee's work here, besides inquiring into the toxicity of these things, is to try and determine whether any new law or new amendments to the law might be needed to strengthen the various acts. What is your opinion, Dr. Griffin, in relation to the Insecticide Act? Do we need some amendments to the law?

Dr. GRIFFIN. In my original statement I made two suggestions. One of them was that the law should more clearly throw upon the manufacturer the responsibility for proving the safety of his materials before registration.

Dr. MILLER. In other words, that he present to you evidence of experimentation and research work that would convince you the substance is suitable for use?

Dr. GRIFFIN. That is right. The second one: While we have not had any difficulty up to the present time, registration under protest is a weakness in the law because it is conceivable that a man who had a product which was not safe would go ahead and register it under protest and put it on the market.

Dr. MILLER. You have no recourse on that man if he comes in and you say, "Well, I don't believe that product is good." You have to register it?

Dr. GRIFFIN. Yes; we have to register under protest. Of course, we can immediately go back to the court and build up an action against them, but that throws the burden of proof on us.

Dr. MILLER. Would it be necessary in labeling his product to note that it was registered under protest?

Dr. GRIFFIN. No; that is not required.

Dr. MILLER. It might be helpful, because people will say there is some doubt about it because it is registered under protest. Have you had many cases where you have registered under protest?

Dr. GRIFFIN. No; we have not had many; and, as I say, up to the present it has not led to any practical difficulties from the standpoint of the toxic residues in foods.

Dr. MILLER. Who passes upon a product as to whether it is or is not toxic, or with respect to the extent that it should be or should not be used in foods?

Dr. GRIFFIN. In our registration procedure we have a pharmacologist, Mr. Ward, who considers all of the evidence which is furnished us, and in the case of new chemicals we go back to the Food and Drug Administration for advice if it's for food use, and to Public Health if it is a question of other hazard.

Dr. MILLER. Then you think those two you pointed out—those amendments—might well be added to the present law?

Dr. GRIFFIN. Yes, and I think there is a third thing, which could well be added to help the Food and Drug Administration, and that is a requirement that there be a method of determination of residues before it was put out for food use. But, as I say, that is not necessary from our standpoint. It is necessary from their standpoint.

Dr. MILLER. You don't have any method now of determining whether fruit that is put into the commercial channels should be cleared as to toxic residues that might be on them?

Dr. GRIFFIN. There are difficulties in determination.

Dr. MILLER. I suppose there would be. That is all, Mr. Chairman.

Mr. ABERNETHY. Thank you very much.

Dr. GRIFFIN. Thank you.

Mr. KLEINFELD. Dr. Magness.

(The oath was administered by the chairman.)

TESTIMONY OF JOHN R. MAGNESS, PH. D., HEAD HORTICULTURIST, DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, DEPARTMENT OF AGRICULTURE

Mr. KLEINFELD. Would you read your statement, please?

Mr. ABERNETHY. Mr. Kleinfeld, may I suggest that our time is limited. I would like to suggest to the members of the committee that we withhold any questions until about 10 minutes of 12.

Dr. MAGNESS. I am not sure I can read it in that time.

Mr. ABERNETHY. It may be a good idea in view of the length of the statement, if it would be satisfactory with members of the committee and counsel, for you to summarize your statement. Would that be satisfactory to you, Mr. Kleinfeld?

Mr. KLEINFELD. Yes, sir.

Mr. ABERNETHY. You might just summarize it, if you like.

Dr. MAGNESS. I can cover the pertinent points, I think, and the list of chemicals, and so forth——

Mr. ABERNETHY. The entire statement will be incorporated in the record.

Dr. MAGNESS. I am John R. Magness, Head Horticulturist in charge of the Division of Fruit and Vegetable Crops and Diseases of the Bureau of Plant Industry, Soils, and Agricultural Engineering, United States Department of Agriculture. That Division has responsibility in the United States Department of Agriculture for conducting research on the protection of fruit and vegetable crops from disease and also for studying handling and storage practices that will preserve the qualities of the crops through market channels. Investigations are conducted on the value of various fungicides and other materials for these purposes.

Point of view in regard to chemicals applied to fruits and vegetables: We give a number of instances to show that use is absolutely

essential. References to specific crops and specific diseases controlled by the application of fungicides can be repeated almost indefinitely. As a generalization, we can say that most of the fruit and vegetable crops produced in humid areas of the United States require the application of fungicidal chemicals to protect them from disease.

The value of fruits and vegetables in our national diet is recognized by all. Materials that are applied to fruits and vegetables for the control of pests must be not only effective in pest control but must also be not injurious to the crop. They must also be completely noninjurious to consumers in the amounts which may be present when the product is consumed.

When compounds are found to be beneficial for certain purposes, their toxicological properties must be studied unless sufficient evidence exists to indicate their safety. Tests by the Division of Fruit and Vegetable Crops and Diseases have shown that certain compounds are highly effective in the prevention of decay of fruits, but they have not been recommended for use because they appear to be hazardous to the health of the consumer. We in the Bureau of Plant Industry are not specialists in toxicology. Our staff consists of plant pathologists, plant breeders, horticulturists, others concerned with plant science. When we develop a chemical or study a chemical that has use for disease control or prevention, we must consult with specialists in other agencies to determine toxicological relationship.

If the Food and Drug Administration have information relative to it or can obtain sufficient information, they give it to us. If not, we try to arrange with other agencies, such as the Bureau of Agricultural and Industrial Chemistry, to make toxicological tests. They are investigating one for us at the present time.

We have listed here the principal chemicals that are in use for disease control at the present time, with a few comments as to how they are used, something of the concentration and so forth. I think most of them are compounds that have a long history of usage and are recognized as not deleterious to health. In case of certain of them, certain questions might be raised. We have also listed the chemicals that are used on seed for seed treatment. That usage is such that the chemicals, while highly toxic in themselves, do not appear on or in the food product. In other words, seeds are treated before planting, and there is no evidence of any significant amount of any of the chemicals in the end product.

I think that covers in very brief summary, Mr. Chairman, my statement, but I would like to have the full statement in the record.

Mr. KLEINFELD. The chairman has so stated.

(The prepared statement submitted by Dr. Magness reads in full as follows:)

USE OF CHEMICALS FOR DISEASE AND DECAY CONTROL IN FRUITS AND VEGETABLES

I am John R. Magness, head horticulturist in charge of the Division of Fruit and Vegetable Crops and Diseases of the Bureau of Plant Industry, Soils, and Agricultural Engineering, United States Department of Agriculture. That Division has responsibility in the United States Department of Agriculture for conducting research on the protection of fruit and vegetable crops from disease and also for studying handling and storage practices that will preserve the qualities of the crops through market channels. Investigations are conducted on the value of various fungicides and other materials for these purposes.

POINT OF VIEW IN REGARD TO CHEMICALS APPLIED TO FRUITS AND VEGETABLES

We would emphasize first of all that the application of fungicidal and related chemicals to certain of our fruit and vegetable crops is absolutely essential to the production of those crops. Without the use of chemicals to protect the crop, total loss in many crops would occur in many seasons when diseases reach epidemic proportions. A few specific illustrations will serve to emphasize this point. Without the use of fungicides applied to the foliage and the fruit of apples, no marketable fruit would be produced in the eastern United States. The apple-scab disease caused by a fungus which grows in both fruit and foliage would in most years completely destroy the commercial value of the crop. Sour cherries, if not sprayed, in most years will lose their foliage by midsummer and trees may be killed by low winter temperatures following such defoliation. In 1950 tomato growers in many areas suffered heavy loss from the late blight fungus disease which attacks both leaves and fruit, rotting the fruit. Without protective sprays and dusts the losses would have been far greater. Control of late blight of celery by the application of fungicides is an absolute requirement for the growing of this crop in humid areas.

References to specific crops and specific diseases controlled by the application of fungicides can be repeated almost indefinitely. As a generalization, we can say that most of the fruit and vegetable crops produced in humid areas of the United States require the application of fungicidal chemicals to protect them from disease.

The value of fruits and vegetables in our national diet is recognized by all. They constitute a major source of important vitamins and mineral nutrients. They add bulk to the diet and also variety and taste appeal. Research workers in the United States Department of Agriculture, as well as the producing and marketing industry, recognize that the healthfulness of fruits and vegetables must not be made subject to question as a result of adding chemicals that may be deleterious to health. Materials that are applied to fruits and vegetables for the control of pests must be not only effective in pest control but must also be noninjurious to the crop. They must also be completely noninjurious to consumers in the amounts which may be present when the product is consumed. When compounds are found to be beneficial for certain purposes, their toxicological properties must be studied unless sufficient evidence exists to indicate their safety. Tests by the Division of Fruit and Vegetable Crops and Diseases have shown that certain compounds are highly effective in the prevention of decay of fruits but they have not been recommended for use because they appear to be hazardous to the health of the consumer. Another compound which has proved highly effective in controlling decay in citrus is now under test in the toxicological laboratory in the Bureau of Agriculture and Industrial Chemistry. No recommendation for use of this material will be made until its toxicological properties have been thoroughly explored and it has been shown to be harmless to the consumer.

Our staff is composed of specialists in the fields of plant disease control, disease control, in plant breeding, and in crop production. They are not trained in the field of toxicology as applied to man or animals. We must depend on specialists in that field in other agencies for information on the possible deleterious effects of the chemicals on the welfare of consumers. We have presented a comprehensive list of chemicals now in use on fruits and vegetables for disease control in the hearings just concluded before the Food and Drug Administration. We believe that the available evidence will indicate that the materials now being used commercially are entirely safe in the quantities present when the produce reaches the consumer. If on the basis of experimental evidence presented at those hearings any of the chemicals now in use for protection of fruits and vegetables are found probably injurious to consumers in the quantities present when offered for sale, proper restriction on their use will undoubtedly be inaugurated by that agency so that the consumer will be fully protected.

CHEMICALS USED ON FRUITS AND VEGETABLES FOR DISEASE CONTROL

Chemicals are used on fruits and vegetables at all stages of their growing and handling. They may be applied to the harvested products to reduce loss from decay or other causes while in marketing channels. They are applied to the developing plants as sprays or dusts to protect the plant from diseases caused by fungi and bacteria. They are applied to the seed before planting to eradicate diseases that may be carried on the seed and to protect the seed and young seedling plant from soil-inhabiting disease organisms.

CHEMICALS APPLIED TO FRESH FRUITS AND VEGETABLES AFTER THEY ARE HARVESTED

Most fresh fruits and vegetables are subject to decay caused by fungi or bacteria between the time of harvest and the time of ultimate consumption. Bacteria and fungus spores widely distributed in nature may be present on the produce when harvested. These may infect the tissues and cause decay while the produce is in transit in cars, while it is being held in storage, or while it is in the wholesale and retail markets. Decay at these stages results not only in direct loss of valuable foods but in greatly increased marketing costs. If large amounts of decay develop, it means that either the total shipment must be dumped after growing, harvesting, packing, and shipping costs have been incurred or the produce may have to be repacked at terminal markets, an extremely expensive operation. Thus prevention of decay in marketing channels is one of the major problems of the fruit and vegetable industries. In order to reduce decay to a minimum, it is essential that only produce that appears to be sound be packed, that adequate refrigeration or other protective transportation services be used, and that proper storage conditions be maintained throughout the life of the produce. Even with all these precautions, excessive losses may occur, particularly when rain or other unfavorable conditions have been encountered during the harvest period. Research agencies, both governmental and private, have made numerous studies on the possibilities of using chemicals to reduce this loss. Certain chemicals have been found valuable on specific products and on specific diseases and are now in commercial use. The following includes the major ones in use, with brief comments on the manner of use, the diseases against which used, and their apparent value:

Benzoic acid.—This compound, long used as a chemical preservative in foods, is highly effective in preventing black rot in pineapples. It is applied as an alcoholic solution brushed on the cut butts of the fruit. The solution used is 2.5 percent benzoic acid in 30 percent ethyl alcohol. The material is not only considered harmless but also does not enter the edible portion of the fruit.

Borax.—This common household chemical is valuable in the prevention of decay on any number of products. Washing in borax solution greatly reduces loss from stem-end rot and green mold of citrus, from black rot and rhizopus rot of sweetpotatoes and cladosporium, alternaria, and fusarium rots of cantaloups. Citrus fruits are dipped in a 5 to 10 percent water solution of borax followed by a light rinse with water. A 1 to 2 percent solution is used for washing sweetpotatoes and about a 5 percent water solution for cantaloups. In general, borax treatment of citrus fruits has reduced decay by 50 percent or more and it has been even more effective for black rot control of sweetpotatoes.

Chlorine.—This chemical used throughout the world in water purification is also added to the water in which vegetables are washed or cooled, in the form of chlorine gas or as sodium hypochlorite. It has been used particularly on asparagus, celery, and tomatoes. Concentrations used generally range around 0.1 percent, rarely up to 0.5 percent. Chlorine aids in keeping the wash water sterile and is beneficial in reducing the amount of decay which may subsequently develop on the produce. The amount of chlorine which might be present on the produce when it reaches the consumer is negligible as compared to the quantities used in purification of domestic water supplies.

Nitrogen trichloride.—Nitrogen trichloride, when applied to produce as a gas either in storage rooms prior to shipment or in loaded cars, has reduced decay of citrus fruits and to some extent of cantaloups, tomatoes, and asparagus. Concentrations used vary from 5 milligrams to 25 milligrams per cubic foot of storage space, depending on the tolerance of the commodity. Exposures are generally from 1 to 5 hours. Experiments, as well as commercial experience, has indicated that such treatment will reduce losses from decay, particularly in citrus fruits and cantaloups. The material is volatile, and little remains on the produce when it reaches the consumer. The traces which might remain we believe to be entirely safe from the standpoint of food contamination. A considerable portion of the citrus crop, particularly in California, is so treated.

Phenyl.—Paper impregnated with the compound diphenyl ($C_6H_5C_6H_5$) is extensively used in packing citrus fruits, particularly where the fruit is to undergo long shipment and handling. Impregnated paper may include wraps of the individual fruits or box liners, layer sheets, and paper bags. As the diphenyl compound slowly volatizes, the gas is quite effective in preventing the growth of blue and green mold and stem end rot fungi in citrus fruits. After the fruit is removed from contact with the diphenyl-impregnated paper the diphenyl odor

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quickly disappears from the fruit. Its presence in newly opened packages can be detected by the odor. No measurable quantities are retained on the fruit at the time of consumption.

Ethylene oxide and propylene oxide.—These compounds in isopropyl formate under the trade name "Fumold" are used extensively on packaged, dried fruit, particularly prunes and dates. The mixture is applied as a liquid to the produce in tight packages. It vaporizes, and the vapors inhibit development of organisms that cause the fermenting or souring of the product. Its use permits packing these dried fruits with higher moisture content than is otherwise possible. When the packages are opened, the material escapes from the produce rapidly and little, if any, is retained at the time of consumption.

Sodium chloro-2-phenylphenate.—This compound, sold under the trade name "Dowicide C," is added to the wash water for apples and pears, particularly in Pacific Coast States. Approximately one-half percent of the chemical is used. In experimental and commercial tests the treatment has reduced decay of these fruits in storage by 50 percent or more. The chemical is volatile and appears not to remain on or in the fruit to any extent after normal storage and handling.

Sulfur compounds.—Sulfur dust is frequently applied to peaches as the fruit is brushed to retard to some extent the development of brown rot. Liquid lime sulfur as a spray or dip prior to packing has also been used. Sulfodioxide gas is used extensively on grapes both in the stoarges and in cars in transit. The purpose is to control botrytis rot and aiso to retain the green color in stems. Treatment consists of fumigation with ¼ to 1 percent of the gas by volume in storages for a period not in excess of one-half hour followed by ventilation of the storage. The treatment may be repeated every 10 days to 2 weeks. Sodium bisulfite is often added to the package at the rate of about 5 grams per 28-pound bag of grapes, also to prevent botrytis and other decay. Dilute solutions of bisulfite are used to a limited extent on some berries and vegetables. These sulfur compounds all appear completely noninjurious to health.

Waxes.—Various waxes are applied to a large number of fruits and vegetables, including citrus fruits, pineapples, tomatoes, cantaloups, potatoes, sweetpotatoes, and others. They may be applied in the form of a water emulsion sprayed or brushed on the fruit, or dissolved in a volatile solvent, or the wax may be heated and sprayed directly on the fruit. The purpose is primarily to retard moisture loss. In some products, dyes to supplement produce color may be added to the wax. The materials used are mostly mixtures of common paraffin and carnauba wax, a vegetable wax obtained from a palm in South America, and are entirely harmless to health.

HORMONE-TYPE CHEMICALS TO MODIFY RIPENING OR GROWTH RESPONSE

Ethylene.—Ethylene applied as a gas while fruits are in coloring or ripening rooms is extensively used on citrus fruits and bananas and to a limited extent on tomatoes, melons, and pears. Concentrations used are generally in the range of one part per thousand of air. The presence of ethylene reduces the time required to ripen bananas and tomatoes, which are normally shipped green. It also reduces the time required to remove the green pigment from the peel of citrus fruit. Traces of ethylene are formed in the normal ripening of practically all fruits and vegetables. The quantity in ripe fruit approaches the concentration used in forced ripening.

Naphthaleneacetic acid.—This compound, or modifications of it, is applied as a dust or atomized spray, or by other means, to potatoes prior to putting in storage to inhabit sprouting. Approximately 1 gram per bushel of potatoes is used. It has been used experimentally for reducing scald development in apples.

A related compound, 2,4-dichlorophenoxyacetic acid, is used experimentally on cauliflower to retard the yellowing and dropping of the leaves while in storage. A solution containing about 50 parts per million of the chemical is sprayed on the plants before harvest or at the time of packing. These compounds are used in great dilution, but appear to have no injurious effects even when consumed in relatively large quantities.

CHEMICALS APPLIED TO DEVELOPING FRUIT AND VEGETABLE CROPS FOR THE CONTROL OF FUNGUS AND BACTERIAL DISEASES

The following chemicals arranged by groups are those commonly used in the United States for the control of plant diseases in many fruit and vegetable crops. This use is such that the chemicals may be present in varying amounts on the edible portion at time of harvest or when offered for sale.

Copper compounds.—Compounds containing copper were among the earliest materials used for the control of fruit and vegetable diseases. They have been widely used in the United States for the past 50 years. The compounds used vary in formulation, degree of solubility, and other respects, but all are dependent upon the copper present for their effectiveness in disease control. Rate of usage of the various compounds is usually based upon the copper content. Principal copper compounds in use include the following: bordeaux mixture, basic copper sulfate, copper oxide, copper oxychloride, copper oxychloride sulfate, copper phosphate, copper silicate, and copper zeolite.

Sulfur compounds.—The element sulfur has long been recognized as one of the most important and valuable fungicidal materials. It is used in various forms. It is combined with calcium to form complex polysulphides as in liquid lime sulfur or merely as a mixture of sulfur and lime as in self-boiled lime sulfur and the dry mix preparations. It may be mechanically ground to varying degrees of particle size. The commercial preparations of ground sulfur generally contain a wetting agent and an inert material to prevent the sulfur from packing or caking. Sulfur may be applied as a spray or a dust and is extensively used in agriculture for the control of both fungi and certain types of insect pests.

Formulations of sulfur in common use include the following: lime sulfur solution, wettable sulfur, flotation sulfur, sulfur paste, self-boiled lime sulfur, and sulfur dust.

Zinc sulphate.—Combined with lime, zinc sulphate is used to reduce losses caused by the bacterial leaf-spot disease of peach. It is also used as a nutrient spray or dust on citrus fruit.

Dithiocarbamates.—In the past decade a series of metal dialkyl dithiocarbamates have been developed as fungicides. Certain of these, particularly the iron, zinc, and disodium salts, have shown definite value and are being widely used for the control of diseases of fruits and vegetables. Four formulations now in wide commercial use are as follows: ferric dimethyldithiocarbamate (ferbam), zinc dimethyldithiocarbamate (ziram), disodium ethylene bis dithiocarbamate (nabam), and zinc ethylene bis dithiocarbamate (zineb).

The coined names "ferbam," "ziram," "nabam," and "zineb" have recently been adopted as generic names for these chemicals by the American Phytopathological Society. The use of these chemicals has increased greatly during the postwar period. In general, they appear to be less injurious to the plants to which applied than are the copper and sulfur fungicides. They are highly specific against certain diseases. For these reasons they are assuming increasing importance in the disease-control program.

Organic mercury compounds.—In the past 5 years a number of organic compounds of mercury available under various trade names have been extensively tested for the control of fruit diseases. They have come into use particularly for the control of apple scab, the most serious disease affecting apple production in the eastern United States. They appear to eradicate the disease even after initial infection has occurred. They are used in extremely great dilution, 1 pound to 2,000 gallons of water, and their use is limited to the early part of the growing season at the prebloom or immediate postbloom stage when the apple fruit is pea size or smaller. The maximum quantity of the chemical that could be present on the fruit when harvested would be about 1 part in 30 millions, based on the weight of the fruit.

TREATMENTS APPLIED TO SEEDS

Losses that result from diseases attacking the seed or young seedlings are greatly reduced in most vegetable crops through chemical treatment of the seed prior to planting. This is true not only for the true seed but for seed-stock roots of sweetpotato and seed pieces of white potatoes. Materials used for this purpose are mostly highly poisonous to animals and care must be exercised to insure that treated seed or seed-piece stock is not consumed. The chemicals applied are present on the surface of the seed or seed pieces when planted. There is no evidence, however, that these materials enter the young growing plant or in any way affect the composition or quality of the edible portion.

Materials applied to seed and seed pieces fall into two categories, as follows: (1) Disinfectant treatments to destroy disease-producing fungi or bacteria that are on the surface of the seed and thus prevent seedling infection; and (2) protectant treatment to coat the seed with a fungicide that will protect the seed and young seedlings against decay and damping-off caused by organisms in the soil.

Disinfectant treatments are most commonly applied as liquid soaks. Protectant treatments are usually applied in dust form shortly before the seed is planted.

The following chemicals are those most widely used for disinfectant treatment: bichloride of mercury, mercurous chloride, mercuric oxide, ethyl mercury phosphate, hydroxymercurinitrophenol, hydroxymercurichlorophenol, ethanol mercuric chloride, sodium borate, copper sulfate, tetrachloro-para-benzoquinone, and formaldehyde.

The following are the chemicals most commonly applied in dust form as protectant treatments for seed: copper oxide, basic copper sulfates, zinc oxide, zinc oxide and zinc hydroxide, hydroxymercurichlorophenol, ethyl mercury phosphate, tetramethyl thiuram disulfide, and tetrachloro-para-benzoquinone.

While most of the chemicals listed above would be highly toxic if eaten by man or animals, their method of use is such that it is believed that none of the chemical is present in or on the edible portion of fruits and vegetables. The most satisfactory of the above chemicals to use will vary with the particular crop.

The materials listed above are those now in appreciable commercial use for disease control in fruit and vegetable crops. Experimental work is continuing and undoubtedly new compounds will be developed of value in the continuing fight against orchard and garden pests. New compounds recommended for use will have to pass the same critical test that those now in use have passed; i. e., they must be effective in controlling the pest, they must be noninjurious to the crop to which applied, and they must be harmless in the quantities present to the consumer.

Mr. KLEINFELD. Dr. Mangess, on page 5 of your statement you mention the use of borax as a valuable chemical to prevent decay in citrus fruits, sweetpotatoes, and canteloups. Is borax fairly widely used for that purpose?

Dr. MAGNESS. It is probably used less today on citrus than it was 15 years ago, but it is still one of the common washes used on citrus. The fruit is passed through a borax solution, and there is a residue of borax, a slight residue of borax, that stays on the surface of the fruit when it dries, and that inhibits the growth of certain rot organisms.

Mr. KLEINFELD. In other words, it is used to help prevent decay?

Dr. MAGNESS. That is right.

Mr. KLEINFELD. Is it used on any other fruits or vegetables, as far as you know?

Dr. MAGNESS. Not to my knowledge to any appreciable extent. There has been in the past a slight usage on tomatoes, but that is not extensive.

Mr. KLEINFELD. Do you know whether it is registered under the Insecticide Act?

Dr. MAGNESS. I could not say as to that It is a common chemical that can be purchased anywhere, so it probably would not be purchased through insecticide houses particularly.

Mr. KLEINFELD, But if it is used to prevent decay in citrus fruits and other fruits and vegetables, must it not be registered?

Dr. MAGNESS. I can't answer that question.

Mr. KLEINFELD. Is it used also as a waxing agent?

Dr. MAGNESS. Not as a waxing agent so far as I know.

Mr. KLEINFELD. Who has made the chronic toxicity tests on borax; do you know?

Dr. MAGNESS. No. Not being a toxicologist, I couldn't speak with authority on that. I know, of course, that it has been used in and on foods for long periods of time, but I am not familiar with the detail of the toxic studies.

Mr. KLEINFELD. It is a fairly poisonous substance; is it not?

Dr. MAGNESS. I believe it is recognized that in excessive quantities it is dangerous.

Mr. KLEINFELD. I know you are not a pharmacologist, but I think generally speaking it is recognized as a fairly poisonous substance.

Dr. MAGNESS. That is right.

Mr. KLEINFELD. I was wondering if you knew, not what the results were, but perhaps who in the Government or outside has made the necessary chronic toxicity tests on borax to determine whether, in the amounts used and considering the residues, it is or is not harmful or deleterious.

Dr. MAGNESS. I know of no specific toxicological studies that have been made, but I don't follow that field closely.

Mr. KLEINFELD. Don't you think such tests should be made by some qualified persons or agency?

Dr. MAGNESS. They should be if the pharmacologists and toxicologists do not consider that they now have sufficient evidence in the case of a compound that has been so long used.

Mr. KLEINFELD. Then although it is somewhat widely used, you are not yourself aware of any toxicological tests that have been made?

Dr. MAGNESS. That is right.

Mr. KLEINFELD. Has your Bureau recommended its use at all?

Dr. MAGNESS. We have published reports that could be considered recommendation, stating the findings from using it.

Mr. HORAN. Might I interrupt there? I think it would be wise for us to recognize that Dr. Magness' field is to prove whether or not any given ingredient will kill the pest. It is up to the toxicologists and pharmacologists and, in my book, the Public Health Service to determine whether or not that ingredient is safe for human consumption. Dr. Magness in his field is merely trying to help producers evolve effective processes for the control of any given fruit or vegetable pest or plant industry pest.

Mr. KLEINFELD. I realize that, sir. I wanted to know if he knew of any other Bureau or agency which had gone into the other point as to whether the necessary tests had been made.

Mr. ABERNETHY. Let me make an inquiry right there. Mr. Kleinfeld, in your experience on this subject, have the tests been made?

Mr. KLEINFELD. I really don't know.

Mr. ABERNETHY. You do not know?

Mr. KLEINFELD. No.

Mr. ABERNETHY. All right.

Mr. KLEINFELD. It is my understanding that, generally speaking, before a recommendation as to use was made, some bureau or agency would be asked if the toxicity tests have been made and what the results were. I am trying to find out whether this was done. I do not know. You do not know either, sir?

Dr. MAGNESS. No; I do not.

Mr. KLEINFIELD. You do not know whether, before making the recommendations which were made, clearance as to possible toxicity or lack of toxicity was obtained from any other agency?

Dr. MAGNESS. Those recommendations go back 25 years or more in regard to citrus fruits. So far as I know no formal inquiry was made as to the toxicity. I believe even far longer than that borax was used on meats and so forth.

Mr. KLEINFELD. Again, there was testimony of Dr. Lehman, which appeared on page 386 of our hearings, indicating, I believe, again in his opinion, that apparently there was some doubt in his mind as to the use of borax on food products. He described it as a poison per se.

Dr. MAGNESS. Yes.

Mr. KLEINFELD. I just wondered what tests had been made. Apparently we do not know now. Dr. Magness, on pages 5 and 6 of your statement you mention the use of nitrogen trichloride to reduce decay of citrus fruits, cantaloups, tomatoes, and asparagus. Are there any other foods where nitrogen trichloride is used, as far as you know?

Dr. MAGNESS. Those are the only ones to which it is applied commercially, so far as I know.

Mr. KLEINFELD. Do you know, in the case of nitrogen trichloride, whether acute and chronic toxicity tests were made by any of the agencies or bureaus concerned?

Dr. MAGNESS. They were not so far as I know, as applied to fruits and vegetables. It is true that this particular process is patented, I believe, by a commercial firm. They license the operation, and I do not know what evidence they have on the subject. This again has not been specifically endorsed by the Department of Agriculture. We have published findings on what it would do from the standpoint of decay prevention.

Mr. KLEINFELD. And it is used for decay prevention?

Dr. MAGNESS. Yes, sir.

Mr. KLEINFELD. Do you know whether anybody conducted tests, for example, to determine whether there was any penetration into the flesh of the fruit by the nitrogen trichloride?

Dr. MAGNESS. There were certain tests conducted. The basic research, I believe, on this was done by a member of the staff of the University of California.

Mr. HORAN. Hasn't Ed Smith done some experiments on this?

Dr. MAGNESS. He has tested other compounds on fruits but not this particular compound. There were certain basic studies made, but so far as I know they did not involve toxicological research.

Mr. KLEINFELD. This is somewhat out of your field. Are you aware of the fact that formerly nitrogen trichloride was used as a maturing agent in flour?

Dr. MAGNESS. Yes, I have known of that.

Mr. KLEINFELD. And after some experimental work by Mellanby, of England, its use in this country was voluntarily discontinued by the baking industry?

Dr. MAGNESS. Yes, sir.

Mr. KLEINFELD. In view of that—well, do you know whether that data and that experimental work were taken into consideration by any agency or bureau in suggesting the use of nitrogen trichloride for decay control purposes?

Dr. MAGNESS. Well, as I understand it, that finding in regard to the possible toxicity of trichloride in flour and breadstuffs is rather recent. In other words, this use on fruits and vegetables antedated that finding. I am not sufficiently familiar with that work to know whether the concentrations that are involved are in any way parallel or not.

Mr. KLEINFELD. You do not know whether anybody has looked into the matter at all?

Dr. MAGNESS. No. We do know that this is a fumigation treatment at rather low concentrations, but what the quantity of nitrogen trichloride in parts per million is that might be present in the fruit after treatment, or the vegetable after treatment, we do not know.

Mr. KLEINFELD. Dr. Magness, on page 6 of your statement you point out that diphenyl is used extensively in packing citrus fruits. Do you know whether it is used on any other foods?

Dr. MAGNESS. The only commercial use I know is citrus fruits, and there it is a case of impregnating the paper either in which the fruit is wrapped or the liners of the packages, or in the case of paper packages, the packages themselves, with the diphenyl. That is a volatile, slow volatile product, which acts as a fungistat and inhibits the growth of decay organisms in the fruit.

Mr. HORAN. You are from Oregon State College?

Dr. MAGNESS. Yes.

Mr. HORAN. One of your colleagues down there developed copper impregnation for deciduous fruit wrappers. What is his name?

Dr. MAGNESS. Hartman.

Mr. HORAN. That was not considered poisonous?

Dr. MAGNESS. No; that was copper, which is generally considered rather safe.

Mr. KLEINFELD. Doctor, diphenyl is a fungicide; is it not?

Dr. MAGNESS. Yes.

Mr. KLEINFELD. And may I assume that it is registered under the Insecticide Act?

Dr. MAGNESS. Well, the men in charge of that act would have to answer. We have no knowledge on which of these products are registered.

Mr. KLEINFELD. Maybe Dr. Griffin would know.

Dr. GRIFFIN. You asked me that question, and I said I would try to furnish you that information.

Mr. KLEINFELD. I am sorry. Thank you.

Do you know, again with respect to diphenyl, whether any tests have been conducted to determine the quantity of residue remaining on fruits?

Dr. MAGNESS. I know of no tests. We do know this: That it is a highly aromatic compound and that the odor cannot be detected after the wraps are removed for a short period of time. One of the objections to the use of diphenyl in the commercial industry has been when the fruit is first removed from contact with the paper there is an odor of diphenyl, but that is quickly dissipated.

Mr. KLEINFELD. So that the presence of diphenyl cannot be detected by its odor?

Dr. MAGNESS. After the fruit has been removed from contact with the diphenyl-impregnated paper for a few hours no odor of diphenyl can be detected on the fruit.

Mr. KLEINFELD. Would that mean that there wasn't any diphenyl remaining?

Dr. MAGNESS. It wouldn't mean that there might not be traces in the tissues.

Mr. KLEINFELD. Now, is it not a fact that the possibility of some objectionable odor or taste from the diphenyl can be deliberately masked or disguised by the use of lemon oil or some other flavor of that character?

Dr. MAGNESS. I don't quite understand your question. You say, "Can it be done?" If you say "Is it done?" I would say "No."

Mr. KLEINFELD. Do you know whether it has been done?

Dr. MAGNESS. Not so far as I know.

Mr. KLEINFELD. On pages 6 and 7 of your statement you discuss sodium chloro-2-phenylphenate, and you state that it appears not to remain on or in the fruit to any extent after normal storage and handling. Is that correct?

Dr. MAGNESS. That is substantially correct; yes.

Mr. KLEINFELD. Do you know again whether any tests have actually been conducted to determine the amount of residue of that product remaining on foods?

Dr. MAGNESS. We have not conducted them, and I know of no tests that have been conducted on that.

Mr. KLEINFELD. Or tests with respect to its penetration into the skin of the product?

Dr. MAGNESS. We have no data on that.

Mr. KLEINFELD. But you have recommended its use, have you not, under some circumstances for certain products?

Dr. MAGNESS. Again, we have investigated its use and reported that when used in certain ways it would reduce the amount of decay that developed in apples and pears by approximately 50 percent.

Mr. KLEINFELD. Doesn't that amount to a suggested use?

Dr. MAGNESS. That is right.

Mr. HORAN. Might I ask a question right there?

Mr. KLEINFELD. Yes.

Mr. HORAN. Because I have been embarrassed and did try to explain to many people why Life magazine showed a bulldozer pushing apples around in Yakima, Wash. I understand several thousand carloads of apples had to be destroyed because no one would handle them in commerce. They had been subjected, I understand, to bull's eye rot, which is a spore which apparently Dowacide might have reduced if applied. Do you know whether Dowacide was used on any of those apples or not?

Dr. MAGNESS. It might have been used on some of them. Of course, that was a combination of bad condition in the fruit and a very draggy market last spring.

But it is true, of course, that here is a chemical that does partially control decay. Its value for that purpose has been demonstrated.

Mr. HORAN. In this case, if Dowacide could have been used safely, Mr. Kleinfeld, it would have resulted, I am certain, in the salvage of that fruit. It meant a lot in railroad revenues, in food values, and to everyone who handled that food, and, of course, the growers themselves had around $2 a box in those apples which had to be destroyed in order to get the boxes back. But Life magazine didn't explain it that way. They just showed the flagrant waste of an economic value. And if Dowacide could have presented some salvage there, it would have been a big saving.

Do you in Plant Industry conduct any experiments along that line? It would seem to me that experimentation in the control of fungus and spores in storage would fall very definitely under your shop.

Dr. MAGNESS. We do a great deal of work on the control of the diseases. We do not investigate ourselves the toxicology of the compound.

Mr. HORAN. That is up to whoever recommends it to you?

Dr. MAGNESS. That is right.

Mr. HORAN. That it is safe to use or would like to have you use it. You do conduct those experiments in Beltsville.

Dr. MAGNESS. Yes, sir.

Mr. HORAN. In all types of storage and in all types of humidity and temperature.

Dr. MAGNESS. Yes, sir.

Mr. HORAN. You conduct similar experiments in Wenatchee, Wash., I happen to know.

Dr. MAGNESS. Yes, sir.

Mr. HORAN. Including gas storage, using all types of gases under controlled conditions.

Dr. MAGNESS. Yes, sir.

Mr. HORAN. And that is strictly experimental.

Dr. MAGNESS. Yes, sir.

Mr. HORAN. You conduct experimentation, I understand, in California and in Florida.

Dr. MAGNESS. Yes, at Orlando. And two locations in California in addition to Beltsville.

Mr. HORAN. And you are conducting experimentations in Florida?

Dr. MAGNESS. Yes, sir.

Mr. HORAN. Where they need it very badly.

Dr. MAGNESS. Yes, sir.

Mr. ABERNETHY. The story I saw about the apple incident was that they offered them at every price imaginable and even tried to give them away; they offered them at 50 cents a box and had no takers, nobody wanted them.

Mr. HORAN. That is right.

Mr. ABERNETHY. I do not see that that is embarrassing.

Mr. HORAN. They did not explain it.

Mr. JONES. What was wrong?

Mr. ABERNETHY. No one wanted to buy them.

Mr. HORAN. It is a spore of a nature Dr. Magness will have to explain, which does permeate the apple and begins internal breakdown in the fruit before the actual decay occurs, and consequently they have the appearance of being edible, and they looked awfully nice in Life magazine, in a colored photograph. However, when you bite into them the internal breakdown has already begun, and while they have even some crispness to them, they still are sick. Of course, Dr. Magness' job is to find ways and means and materials that will enable producers to be assured that that won't occur. That means a loss of millions of dollars to the fruit producers of the State of Washington. We produce and ship around 60,000 carloads of all types of fruit annually, out of the State of Washington, so we are in the game, I guess, out there—we are in the business at least. And that was a big loss, and the producers stood practically all of that.

Mr. ABERNETHY. Mr. Kleinfield.

Mr. KLEINFELD. Dr. Magness, in discussing waxes at the bottom of page 7 of your statement, you state that these are mostly mixtures of common paraffin and carnauba wax and these are "entirely harmless to health." Some of these waxes also include bactericidal agents such as borax, do they not?

Dr. MAGNESS. They could be incorporated. So far as I know they are not in the ones that are commonly used. Of course, any packer

could incorporate borax in the wax if he saw fit. I believe the product of one commercial firm, at least, formerly did incorporate borax, the so-called Brodex Process.

Mr. KLEINFELD. Do you know whether some of these waxes use or have used in the past sodium orthophenylphenate?

Dr. MAGNESS. I do not know whether they have or not.

Mr. KLEINFELD. Carnauba wax has been used for some time, hasn't it?

Dr. MAGNESS. I understand so; yes.

Mr. KLEINFELD. Again do you know whether the chronic toxicity tests which I have been mentioning have been made for carnauba wax?

Dr. MAGNESS. I do not know whether they have. Of course, it is generally considered that these vegetable waxes are rather innocuous. We eat them whenever we eat fruit, the natural wax on the fruit itself in the case of apples.

Mr. KLEINFELD. The reason I ask is because, as I mentioned, you said these were entirely harmless to health. I assume somebody must have made such a report to you on the basis of both acute and chronic toxicity studies. You do not recall if anyone made such tests?

Dr. MAGNESS. I think the statement——

Mr. KLEINFELD. The bottom of page 7.

Dr. MAGNESS. That was an expression of opinion which perhaps should not have gone in there.

Mr. KLEINFELD. I see.

Dr. MAGNESS. We have never heard the healthfulness has been questioned. I will put it that way.

Mr. KLEINFELD. These waxes have been either recommended or suggested for use, have they not?

Dr. MAGNESS. No. There again the Department has published what they will do and what they won't do, and as far as the waxes are concerned we don't consider them of a great deal of value. They do prevent wilting to some extent in produce, loss of water vapor from the produce. That seems to be their only usefulness.

Mr. KLEINFELD. They are in use, are they not?

Dr. MAGNESS. They are in use; yes, sir.

Mr. HORAN. How about paraffin? Don't they use that any more?

Dr. MAGNESS. Paraffin—usually a mixture of paraffin and some other materials. There are several commercial preparations on the market.

Mr. KLEINFELD. Dr. Magness, do you know whether some of the commercial fungicidal washes for fruits contain trioxymethylene?

Dr. MAGNESS. Trioxymethylene?

Mr. KLEINFELD. Yes. Do you know whether they do?

Dr. MAGNESS. I do not know of any that do.

Mr. KLEINFELD. On page 8 of your statement you mention naphthalene acetic acid and 2,4-dichlorophenoxyacetic acid and state they appear to have no injurious effects even when consumed in relatively large quantities. Now, do you know whether it is a fact that naphthalene acetic acid is considered to be a poisonous substance?

Dr. MAGNESS. Well, in the case of those compounds there have been animal feeding tests conducted even to the extent of pasturing livestock on pastures that have been treated with the 2,4-dichlorophenoxyacetic acid where it would be used in concentrations of 20 to 100 times

what is used on fruits and vegetables, and there have been no findings of deleterious effects on animals even from that heavy usage. There has been one case, at least, of reported poison where certain chemical changes were brought about in sugar beets, I believe, with the accumulation of nitric acid which proved toxic to cattle, but it was not a direct effect of the 2,4-dichlorophenoxyacetic acid.

Mr. KLEINFELD. Do you know who conducted those tests which you mentioned?

Dr. MAGNESS. The early tests on the 2,4–dichlorophenoxyacetic acid were conducted by specialists in the Bureau of Animal Industry in cooperation with certain of our staff who furnished the materials and so forth for feeding. That was in the early days when this material was first being used as an herbicide, and it was a very important question whether it would be toxic to animals.

Mr. KLEINFELD. There have been some reports, I believe, that liver damage has been observed in animals as a result of injections of fairly large amounts of 2,4–D. Now, of course, these reports indicated that fairly large amounts of 2,4–D were actually injected. Do you know whether that was taken into account when 2,4–D was used, as you say, on page 8, "experimentally on cauliflower"? What do you mean by "experimentally," Dr. Magness?

Dr. MAGNESS. I mean it has not yet gone into commercial use, but experiments have been conducted with it which indicate it is of value. In other words, there has not been a carload of cauliflower treated with this material up to now, but it has been used experimentally to find out what could be done with it.

Mr. KLEINFELD. Apparently it served its purpose fairly well.

Dr. MAGNESS. It does make cauliflower retain its leaves and improves its appearance, but it is one of those marginal benefits, we do not know whether it will actually go into commercial use or not. That remains to be seen.

Mr. KLEINFELD. Do you know whether anybody is conducting chronic toxicity tests on it?

Dr. MAGNESS. This 2,4–dichlorophenoxyacetic acid, as you know, is used to the extent of millions of pounds as an herbicide. So far as animal feeding is concerned, that would constitute almost Nation-wide tests, because they will get some of it from pastures and grains and so forth that are treated. I know of no one that is conducting specific work on it now because I think most toxicologists feel the question has been pretty well answered.

Mr. KLEINFELD. Do you know of any definite reports of investigation on that?

Dr. MAGNESS. Well, I know of one specific one on that earlier work that I referred to.

Mr. KLEINFELD. About how early was that?

Dr. MAGNESS. About 1946 or 1947 it was published. I could get you the exact reference to that.

Mr. KLEINFELD. But it is only being used experimentally right now on cauliflower; is that right?

Dr. MAGNESS. That is right.

Mr. KLEINFELD. Is it used on anything else?

Dr. MAGNESS. Its related compounds are used on potatoes as sprout inhibitors, not these particular compounds, but in the same group of

chemicals, and they are used on fruits to prevent or to retard the dropping of the fruit at harvest time.

Mr. KLEINFELD. Do you know whether 2,4–D has been registered under the Insecticide Act?

Dr. MAGNESS. I am sure it has been because it is one of the most widely used herbicides which now come under the act, but I don't have first-hand knowledge.

Mr. KLEINFELD. Do you know whether naphthalene acetic acid has been registered?

Dr. MAGNESS. I couldn't answer in regard to that.

Mr. KLEINFELD. Wouldn't they both have to be registered if they are designed to serve the purpose which you have mentioned?

Dr. MAGNESS. As I understand it, they have to be registered if they are to be used as insecticides.

Mr. ABERNETHY. Mr. Kleinfeld, wouldn't that be a question for the previous witness to answer?

Mr. KLEINFELD. I think so. Do you know, Dr. Griffin, whether those two substances have been registered?

Dr. GRIFFIN. 2,4–D has been registered as a herbicide. You are talking now about growth-regulating things which are not economic poisons and not registered.

Mr. KLEINFELD. Not used as fungicides or insecticides?

Dr. GRIFFIN. The uses he is describing are not insecticide or fungicide use.

Mr. KLEINFELD. I have no further questions.

Mr. ABERNETHY. Do the members have any questions?

Mr. HORAN. Just to thank the doctor for appearing here. We were neighbors in Wenatchee for a long time.

Mr. ABERNETHY. The commitee is now adjourned.

(Whereupon at 12 noon, the committee adjourned.)

CHEMICALS IN FOODS AND COSMETICS

TUESDAY, NOVEMBER 13, 1951

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE TO INVESTIGATE THE
USE OF CHEMICALS IN FOODS AND COSMETICS,
Spokane, Wash.

The select committee met (pursuant to H. Res. 74 and H. Res. 447, 82d Cong., 1st sess.; continuing the investigation and study begun under authority of H. Res. 323, 81st Cong., 2d sess.) at 9:30 a. m., in the district courtroom, United States Post Office Building, Spokane, Wash.; Hon. E. H. Hedrick presiding.

Present: Representatives Hedrick of West Virginia, Jones of Missouri, Miller of Nebraska, and Horan of Washington.

Also present: Vincent A. Kleinfeld, chief counsel, and Alvin L. Gottlieb, associate counsel.

Dr. HEDRICK. The committee will come to order, please.

First we want to thank your lovely city of Spokane for the privilege of appearing at this time and meeting some of you grand people. I have heard a lot about Spokane in my time. It is the first time, though, I have ever had the privilege of visiting your city. It certainly has a nice appearance and looks like a real business city to me.

This committee that appears here today was set up in August 1950 as a "select committee" to investigate the use of chemicals in food products. It was set up under House Resolution 323 introduced by one of our distinguished former Members, Frank B. Keefe, of Wisconsin, who has spent years studying the effect of chemicals in foodstuffs, insecticides, and fertilizers. We started holding hearings in September 1950, and have had numerous hearings in Washington, D. C., and in Chicago. We have accumulated some very important evidence as to the effect of certain sprays and chemicals in foods.

We are operating now under House Resolution 74, which was recently amended by House Resolution 447 to extend the authority of the committee to investigate the effect of chemicals in cosmetics.

Today we will probably take up sprays, and we will be here in your city today and tomorrow.

Mr. Kleinfeld, do you have anything to say?

Mr. KLEINFELD. No, sir, except to thank Major Chase, our first witness, for being very kind to the committee in making the necessary arrangements.

Dr. HEDRICK. We thank you very much.

Mr. KLEINFELD. Mr. Chase, will you take the stand, please?

(The oath was administered by the chairman.)

TESTIMONY OF C. E. CHASE, WENATCHEE, WASH.

Mr. KLEINFELD. Will you please read your statement?

Mr. CHASE. My name is C. E. Chase; my address, 200 North Miller Street, Wenatchee, Wash.

Permit me to say that we are most appreciative of the opportunity to appear before this committee in the State of Washington. I am appearing as a layman who has had a great deal of practical experience in the use of insecticides during a period of over 35 years. By profession I am a civil and hydraulic engineer, which profession I have not actively practiced since 1919. I have owned and operated apple orchards for nearly 40 years. At the present time I reside on a 5-acre orchard which I have owned and operated since 1925. A large percentage of our fruit production in the Northwest comes from acreages of from 5 to 20 acres. I have also owned and operated packing and storage plants in the Wenatchee and north central Washington district for many years, and assembled, packed, and shipped apples from this district throughout the United States, as well as making export shipments.

Today I am appearing on behalf of the fruit growers and shippers of the State of Washington, whom I was authorized to represent at the residue hearing in Washington, D. C. Starting in 1937, I represented the apple and pear industry in Washington, D. C., in an attempt to secure more favorable tolerances in connection with the use of arsenate of lead in the spraying of apples and pears. At that time, the tolerance was 0.01 grains of arsenic trioxide and 0.018 grains of lead per pound of fruit. These tolerances were so drastic that it was largely the cause of the uprooting of thousands of acres of commercial orchards and the bankruptcy of hundreds of capable industrious farmers.

With the assistance of Congressman Cannon and Levy, Senator Schwellenbach and others, we were successful in getting Congress to make an appropriation for the United States Public Health Service, and to authorize them to conduct a study to determine just how much residue of arsenate of lead (used in the spraying of apples and pears) could be left on the fruit and still leave the fruit safe for human consumption. At the same time the appropriation bill for the Food and Drug Administration provided that no part of the funds should be used for laboratory investigations to determine the possible harmful effects on human beings of spray insecticide on fruits and vegetables. The Secretary of Agriculture, under whom the Food and Drug Administration was then operating, agreed to set administrative tolerances at whatever level was recommended by the United States Public Health Service, as a result of their studies. This study, described by Dr. Robert A. Kehoe, director of the Kettering Laboratory, College of Medicine, University of Cincinnati, as being one of the most thorough and complete studies he had ever had knowledge of, resulted in the setting of administrative tolerances at 0.025 grains per pound of fruit of arsenic (trioxide) and 0.05 grains per pound of fruit of lead, as recommended by the Public Health Service.

This liberalization gave new hope to the apple industry of the Pacific Northwest, as it enabled them to use less harsh methods in cleaning the fruit. Formerly it had been necessary to use excessive heat and strong chemicals which resulted in injury to the life or keepability of the fruit. Details of this period in more complete

form are well known to members of your committee from apple-producing areas in the Virginias, in Missouri, and the States of Washington and California.

In June and July of 1944 I conducted presentation of testimony at the hearing in Washington, D. C., for the apple and pear industries of the Pacific Northwest, called by the Federal Security Agency to set a tolerance on fluorine (Cryolite) which was being used in conjunction with or in the place of arsenate of lead in the spraying of apples and pears. Previous to the hearing, the administrative tolerance on fluorine had originally been 0.01 grains per pound, but had been liberalized by the Secretary of Agriculture to 0.02 grains per pound of fruit. However, our spraying requirements had so increased because of apparent resistance of codling moth to the sprays that we needed a more liberalized tolerance if we were to use fluorine. The hearing resulted in a proposed tolerance of 7 parts per million of fluorine, or approximately 0.05 grains per pound.

I also represented the producers of apples and pears of the Pacific Northwest at the spray residue hearing conducted by the Food and Drug Administration at Washington, D. C., beginning in January of 1950, the results of which have not been announced. I did not appear personally as a witness, but secured witnesses, and presented a great deal of technical information. These witnesses appeared at Washington for the hearings. Their testimony, together with the technical information as to residue, toxicity, necessity for use, and so forth, was placed in the record. I have carefully read the testimony of most of the witnesses who have appeared before you, and which appeared in your published transcripts. I found much testimony with which I agreed.

I am not an expert in connection with chemical additives to food, but as a layman, it appears to me that there is a distinct difference between chemical additives to food and insecticides required in the production of fruits and vegetables. It would appear that they should be considered entirely separate. My statement is confined to insecticides as used by producers in the Pacific Northwest. Our use of insecticides is, however, quite generally similar to their use in other areas of the United States, and probably elsewhere.

I am sure the committee realizes that the producers of fruits and vegetables are vitally interested in the health of the consuming public. We know that we must deliver products which are safe for public consumption if we are to survive as producers. That producers are their own "guinea pigs" was clearly shown in the 3-year study made by the United States Public Health Service in the Wenatchee district, ending in 1940. During the course of that study they found apple growers and others in the producing areas consuming apples with more than 20 times the amount of residue remaining from arsenate of lead sprays permitted in interstate shipment. Many of the growers and inhabitants had been doing this for over 30 years. All of this was without perceptible ill effect on their health. This is also known more in detail by several of your committee members.

Due to our many years of experience with tolerances in the past which were so destructive to us, and later on determined by research to be unjustifiably harsh, we have felt that the toxicity of insecticides for determination of tolerances should be the responsibility of in impartial agency of the Government—an agency not involved in the en-

forcement of these tolerances. At our suggestion, in January 1950 Congressmen Cannon and Horan wrote letters to the Administrator of the Federal Security Agency to determine whether or not this could be done by the United States Public Health Service, which they considered to be a qualified, impartial agency. Replying to these letters—which were really a proposal that the United States Public Health Service be authorized to conduct research designed to supply data on insecticidal residue levels safe for human consumption—the Administrator stated——

Mr. HORAN. Might I add there that Dr. Hedrick is on the subcommittee that agreed to the use of those funds and is aware of what we were trying to do.

Mr. CHASE. Replying to these letters the Administrator stated:

> That there would be no conflict between the work of the Food and Drug Administration and that of the United States Public Health Service if such a project were undertaken; that the Food and Drug Administration had neither the facilities nor the appropriation to undertake such studies; that the Food and Drug Administration does not have the clinical set-up to do what the Public Health Service could do in observing human subjects That the Public Health Service is now carrying on a certain amount of toxicological work, and the expansion of the work of the Public Health Service to the point where sufficient information can be secured about the newer chemical compounds is being hampered by lack of adequate funds. A program designed to study the entire spray residue problem would require substantially larger sums, and should be undertaken on a continuing basis.

The Administrator further stated:

> I favor a project by the Public Health Service authorizing it to investigate the relation of the use of spray materials to human health, though I believe such a program would require substantial new appropriations.

In view of the Administrator's letter, we immediately took steps to assist in an appropriation being made to the Public Health Service for this work With the assistance of Congressmen Horan, Cannon, and Whitten, Senator Russell, and others, a small sum was secured to start the work last year. The work was begun, and an additional appropriation in a larger amount has been made this year.

We feel that this is the beginning of the work that should be carried out on a continuing basis, as suggested in the Administrator's letter. Much to our gratification and without suggestion on our part, the Public Health Service has established a toxicological laboratory at Wenatchee. This was chosen as an excellent location for carrying on the work of this nature; and we are more than gratified that your committee will be able to visit this laboratory and get first-hand information on what is being done and what they propose to do in the future.

We believe, and strongly urge, that in the future all tolerances set under the procedure authorized in the Food and Drug Act, including administrative and tentative tolerances, be based entirely on the recommendations of the United States Public Health Service, as was done in establishing the administraitve tolerances on arsenic and lead. In addition to their own research, the United States Public Health Service, in arriving at tolerances safe to public health would be the competent authority reviewing the results gained from research work and studies made by other laboratories, colleges, and agencies, and also from whatever authentic information they received from manufacturers.

The United States Public Health Service was one of the first agencies established by our Government. Their findings and conclusions are accepted throughout the scientific world.

We believe that the Food and Drug Administration should be an enforcement agency only in enforcing rules and regulations pertaining to insecticide tolerances and their application to fruits and vegetables. The problems of enforcement inevitably subject them to considerations that, in our opinion, should not be permitted to infringe upon research in any way. This, of course, would particularly apply to this agency not making determinations of their own in connection with the toxicity of insecticide residues which result from spraying and other uses in the production of fruits and vegetables.

Another important factor of this question is the determination of necessity for use of insecticides. We believe this should be done by the United States Department of Agriculture, as is now authorized by the Federal Insecticide, Fungicide, and Rodenticide Act of 1947. The United States Department of Agriculture is an agency vitally concerned with production and consumption. They are vitally concerned with the health of consumers. From the testimony of Dr. Fred C. Bishopp and Dr. E. L. Griffin of the Department of Agriculture, together with that of Dr. George C. Decker, of the Illinois Agricultural Experiment Station, and others, before your committee, it appears to us that but little additional legislation is required to protect the public under this act. If, in the judgment of this committee, further legislation becomes necessary, it would seem it should be accomplished by an amendment to the act of 1947.

From the testimony of these witnesses, it appears the Department of Agriculture, in determining the label requirements for insecticides, and whether they shall be released for use, obtain all available known information and evidence in connection with the insecticides they are considering. They call on the Food and Drug Administration, the United States Public Health Service, manufacturers, research organizations, both private and public, as well as colleges and experiment stations which may have knowledge of the particular insecticide being considered. From this evidence, after evaluating it, they make their decision as to the label requirements as well as whether or not they will approve its use.

It would seem that this would be the safest and fairest method in making these determinations, and much better than setting up a very large and fully staffed toxicological laboratory under the Food and Drug Administration to do this work.

In many instances, the testimony before your committee indicates that the witnesses feel that an impartial agency should make the determination of toxicity. In some instances they refer to the Food and Drug Administration as being such an impartial agency. With all due respect to the Food and Drug Administration, we have found them to have been loath to change their minds when they have set an informal or tentative tolerance. And, characteristic we think of most enforcement officials, they do not like to admit mistakes. As mentioned before, this has been very costly to our industry, and thus greatly impaired the welfare of producers.

We believe that if your committee concludes that further funds in the way of appropriations should be made available to the United

States Public Health Service, as suggested by the Administrator, it would be very helpful to the entire program if you will so recommend.

In view of our past experience, and after carefully studying much of the evidence presented to your committee, we respectfully propose a program in respect to insecticides used in the production of fruits and vegetables as follows:

1. That the determination of use of insecticides remain the duty of the United States Department of Agriculture, and any further authority the committee feels necessary be supplied by amendments to the present Federal Insecticide, Fungicide, and Rodenticide Act of 1947.

2. That all determinations of toxicity in connection with the use of insecticides by the fruit and vegetable industry be determined by the United States Public Health Service and all tolerances set under the procedure authorized in the Food and Drug Act, including administrative and tentative tolerances, be based entirely on recommendations of the United States Public Health Service.

3. That the Food and Drug Administration be designated as the enforcement agency for which we believe they are well organized and qualified, and that their authority be limited to enforcement of the law.

We are confident that the fruit and vegetable industry would approve such a program and lend their united support toward its enactment and adoption.

Thank you.

Dr. HEDRICK. That concludes your statement?

Mr. CHASE. Yes, sir.

Dr. HEDRICK. Mr. Horan, do you have some questions?

Mr. HORAN. Mr. Chairman, we are going to visit the laboratory that has been mentioned in Mr. Chase's statement, and you are aware of what they are trying to do there.

Dr. HEDRICK. Yes.

Mr. HORAN. At this point in the record I think it would be well to include a statement from Dr. Sumerford who is in charge of that laboratory so we will have it as a matter of record—what they are trying to do. I would like to have it included at this point in the record.

Dr. HEDRICK. We can ask Dr. Sumerford to testify later.

Mr. CHASE. Dr. Sumerford is supposed to be here. I do not see him yet, but he is supposed to be here.

Mr. HORAN. We want to have it as a matter of record.

Mr. CHASE. Mr. Kleinfeld has a copy.

Dr. MILLER. I would like to have a copy to look over.

Mr. HORAN. Each member of the committee would like to have a copy.

Mr. CHASE. They will be available shortly.

Mr. HORAN. I think it would be very wise, Mr. Chairman, for us to have Dr. Sumerford appear before this committee if we have the time, and I think we will have.

Dr. HEDRICK. Oh, yes.

Mr. HORAN. Because this is a vital subject to all folks who have to prepare food for human consumption in the United States, and we are trying to get a safe procedure over there in order to enable producers and processors to know what they are doing when they put these food-

stuffs in the channels of commerce. While we may appear to be speaking from a standpoint of northwest industry here, what we are talking about is applicable to the entire Nation and, therefore, very important. I think this is true—and it may just as well be a matter of record—that where you do have an industry that is closely organized as ours must necessarily be out here, you do find an area that is more easily approached by what you might call bureaucratic procedures, and therefore is more susceptible to policing. When you have a producer here in that part of the State, and you only have three or four producers of a certain commodity in an entire State, they are not so easily policed as we are out here. So you are going to find that emphasis, I think, appealing to you as a committee out here when you approach this matter.

We have felt that apple producers, for instance, in other parts of the Nation were able to crawl out from under the policing we have had out here because we have got a whale of a lot of production on a few acres out here. Consequently, we are more approachable from the standpoint of policing and we have felt these things.

Dr. HEDRICK. I think you are entirely right, Congressman.

Mr. HORAN. I wanted to bring that out because you will find it here, and you will find a different approach probably than you will elsewhere in the Nation. However, the facts are the same. We are able, I think, to bring more evidence to the committee because of that fact.

That is all I have to say.

(Discussion was continued off the record.)

Mr. HORAN. Mr. Chairman, I want to say this: It is almost a new field Dr. Sumerford and his colleagues are working on over there, and any suggestions from the committee when you see it I know will be appreciated by them, because they are trying to do a job. I have checked on them twice since they set it up about a year ago. You will recall when we got the original appropriation.

Dr. HEDRICK. Yes.

Mr. HORAN. We are trying to do a job, and anything we see over there that will be helpful to them, they will appreciate it.

Dr. HEDRICK. Are there any questions, Dr. Miller?

Dr. MILLER. Yes, sir; I have a few.

Major Chase, I would like to ask a few questiosn relative to the tolerances for arsenic trioxide, and so forth.

Does the State of Washington use the same tolerances for the sale apples within the State that are used for those sold in interstate commerce?

Mr. CHASE. It is not in the State law to that effect. Our State law requires that all fruits and vegetables be visibly clean.

Dr. MILLER. In other words, it is softer and more lenient than the law covering interstate shipments?

Mr. CHASE. Except they are very helpful and careful to watch that usually without question fruit, all of the fruit, is prepared for interstate shipment.

Now you will have appearing before you the supervisor of horticulture, the State of Washington in Seattle, who is very familiar with the laws of the State of Washington and can give you the exact information on it.

Dr. MILLER. To be specific, Major, does the State of Washington have the same tolerance for arsenic trioxide and lead in the sale of apples within the State, as they do for apples shipped in interstate commerce?

Mr. CHASE. To the best of my knowledge, no.

Dr. MILLER. The answer would be "No."?

Mr. CHASE. Yes.

Dr. MILLER. You spoke about certain tolerances that you have here within the State and that they have been changed from time to time because of experiments that have been carried on. Do you know whether any States permit a larger tolerance on apples of arsenic trioxide, or lead, or other insecticides than you do here in Washington? How about Mississippi, for instance? They have some apples down there.

Mr. CHASE. I do not know that they have any State laws covering tolerances. I am quite sure New Jersey does not have, although it may have been changed. I doubt that New York has.

Dr. MILLER. If all the apples produced within a State are used there and not shipped in interstate commerce, it is then up to the State to make their own tolerances?

Mr. CHASE. Yes.

Dr. MILLER. I wanted to ask, too—I notice the permissible residues of fluorine and arsenic trioxide have changed from time to time. Have you found it necessary to use a more potent or a stronger solution in order to control, for instance, the codling moths or other insects?

Mr. CHASE. Yes. Congressman Horan will recall in the early days we used one or two sprays of arsenate of lead and we had perfect control. Later on that raised up to where we used from 9 to 12 sprays and didn't secure control under very much greater pressure.

Dr. MILLER. Do you think the codling moth becomes immune?

Mr. CHASE. They apparently do build up very strong resistance, at least.

Dr. MILLER. I wonder if they have done anything at the laboratory—it may be too early to tell—as to what resistance these insects might build up.

Mr. HORAN. I am sure, Dr. Miller, you will find qualified men in this room now to testify to that fact because, you see, you have a new generation of codling moth emerging after the spray period and, of course, it is only a matter of genetics to know that those who do survive and have been able to, have gone through the perils of a cover spray and probably are resistant.

Dr. MILLER. Maybe the members of the animal kingdom have some means of immunizing themselves to the inroads of civilization.

Dr. HEDRICK. The house flies have been very busy building up immunity to DDT.

Dr. MILLER. Mr. Chase, I notice on page 3 of your statement you say—

> I am not an expert in connection with chemical additives to food. But as a layman, it appears to me that there is a distinct difference between chemical additives to food and insecticides required in the production of fruits and vegetables.

I think there is a distinct difference, but when they get in the intestinal canal there is not much difference. It is the same poison whether it is on an apple or taken some other way.

Mr. CHASE. I meant to imply I do not know anything about the additives of food as applied to bread or a great many other products. I imagine when the poison gets in the stomach it is as effective from one source as it is from another.

Dr. MILLER. I want to give further thought to the type of agency which should be the one who makes the determination on these tolerances. I do not know whether it should be the Public Health Service or a group of scientists not connected with Government that might well provide the source of setting up tolerances.

Mr. HORAN. Might I add there the experience of this industry here?

I might say the apple industry—that applies, of course, to winter pears—of the State is capable of shipping in the neighborhood of 70,000 carloads of fruit in interstate commerce a year, which is in any man's book a rather important item of commerce.

Dr. MILLER. And I might say, I think the main factor in the shipment is the consumer.

Mr. HORAN. Oh, definitely.

Dr. MILLER. You must not lose sight of the consumer and put all the emphasis on the producer. It is the fellow who is going to consume the fruit who has to be considered.

Mr. HORAN. That is definitely true. Of course, early in the history of this industry, which began with the turn of the century, and since, we have had the element of self-policing.

Dr. MILLER. You have done a good job.

Mr. HORAN. Late in the nineteenth century we had an importation of nursery stock from Asia, which landed at San Jose, and on that nursery stock was some scale. That scale was of a peculiar nature. It was Asiatic scale. Since it landed at San Jose we have called that scale San Jose scale. It attacks the living membranous parts of a living tree. The scale is capable of laying its eggs on an apple, but it can't live there. However, since the importation and the injection of that infestation on the fruit industry we have, in order to control the scale, forced the people who may be your neighbors as fruit producers to take care of those trees and control that scale, which only attacks the living parts of the tree. In order to force them to take care of that scale, which attacks the tree for years, we have denied the producers in the State of Washington the right to ship any fruit out of the State that has any scale marks—marks, mind you, not scales—marks.

Dr. HEDRICK. What does a mark look like?

Mr. HORAN. It looks like a white spot, and almost looks like the lentizels which are native with an apple. You have seen the lenticel spots on the apple?

Dr. HEDRICK. Yes.

Mr. HORAN. Those scale marks do not look much different. There is no question but that the apple with a scale mark on it is absolutely all right, but in order to force the producers to take care of his trees, we have said, "You can't ship that out of the State." That is part of our grading rules.

The time has been when we had trouble with export markets. The time has been when winter pears or Howells, particularly pears shipped to Argentina, have been dumped out and examined for scale marks. If they found a scale mark they condemned the entire ship-

ment. There was nothing wrong with them, but they just wanted to deny our use of the Argentine market. We have had that happen. So you are talking to an industry that is used to self-discipline here, and they have been doing it in order to maintain the stature of their articles in commerce.

Now to get back to this business of tolerances, Dr. Miller. We have progressively, since that incident when two shipments of apples arriving in London; one was from South Africa that was not sprayed and one was from the United States that was sprayed, and the fellow who had the South African shipments looked at our apples, and at that time we were not even washing them, and they were covered with spray residue, so he said, "Those things will poison all the people of London." So he invoked an old English ale law. That was in 1925. So our shipment to London was tied up, and our fight with the spray residue problem begins there. .

The Food and Drug took over, and from 1925 on we have met various tolerances, first, visible residue, and started wiping our apples. Then fellows like Rex Tugwell and Mr. Wallace came into the Department of Agriculture, and they said, "Well, now you are going to have to remove it all." And the people in this area here, producing, as I say upward of 60,000 carloads a year of all fruits, were trying to abide by those rules. It got to a place where about 1939 the State grange here actually had a resolution calling for a suit against the Federal Government for a hundred million dollars. That was in 1939. That was a hundred million dollars then. That is the way they felt about it. It was about that time that my predecessor, the Honorable Charles Leavy, got in touch with Clarence Cannon and with Senator Russell, and out of that we got the Public Health Service to come in here and conduct very thorough clinical experiments to discover what would be a safe level for arsenate of lead.

Mr. Chase, in his testimony says, arsenic and lead. We have never used arsenic as such as an insecticide. It has been arsenate of lead, which is an entirely different matter. However, we do make determinations as to the arsenate of lead left on the fruit after it is washed with an alkali wash.

The Public Health Service came in here at a time when our tolerance was 0.018 grains per pound of arsenate on the fruit. The tolerance was becoming very intolerant, I might add, because later in the year when the weather turned colder we had to increase our heats in the washing procedures, which you will see when we visit the fruit industry day after tomorrow, are up to as high as 110 degrees Fahrenheit, and the fruit which we have to ship thousands of miles in order to sell, suffered in its "keepability." The people out here really were bothered, and our resistance to any faith in the Food and Drug Administration as a flexible agency capable of adjusting or even determining what the level of tolerance should be stems from that experience, and you will find quite a resistance to any agency that will not look at the facts and make their determinations therefrom.

We have every regard and the very highest esteem for the Food and Drug Administration out here, but we do feel that it is a proper function for the Public Health Service to do this sort of thing. After experimenting thoroughly the Public Health Service declared the tolerance too low.

Dr. HEDRICK. You are quite right.

Mr. HORAN. We think it makes the Public Health Service useful to the Nation and gives them something that is really in their line. I hope that I have not taken too much time. I hope that I have outlined this experience that the people out here have had so that you will understand.

Dr. MILLER. I think so. My only thought was this: The committee must be interested in the protection of the public. That is the first consideration, and it shall be my thought all along to see that the public is protected.

I do know I am engaged in the raising of grapefruit and oranges in the South. It is a small orchard, 20 or 25 acres, but I know some practices are carried on among orange growers and others that need some policing from time to time. It takes cooperation not only between the Agriculture Department, but the Public Health Service, and the Food and Drug Administration if they are going to make progress, whether it is in apples or grapefruit or oranges or vegetables. And the toxicity and requirements as to what effect they will have upon consumers, should be the No. 1 problem of the committee.

I can see, as we progress with chemicals, with the use of insecticides—and they are pouring on the market by the hundreds in various combinations—that the laboratory here or the Public Health Service or some agency must determine whether these proposed insecticides will be injurious to the food stream and not how much you can raise and throw onto the market, but how safe they are going to be when you do raise them and put them on the market.

I am very happy to know that your State here has been diligent. I am sure you have been. I think you are leading the rest of the States in the matter of tolerances. I think some of the States are rather lax in not setting tolerances. Maybe the people of their own States get a little larger dose of poison than they do out here in Washington.

Mr. HORAN. Might I remark here that, of course, we knew at the time when we were having difficulty in our shipments that there were cases in New York State where fruit that was not even washed which might have been sprayed was permitted to have intrastate shipments. That happened right in your own area, Mr. Kleinfeld.

Dr. MILLER. It is important.

Mr. HORAN. So long as it did not go interstate, the Food and Drug Act did not apply, and we knew of cases where unwashed fruit was being sold freely in New York State.

Dr. MILLER. I think here where you are a great exporting State you are in a position to have the confidence of the apple-eating public by setting up standards that they will respect, and you are doing that. I believe the next few days will give us all a little information about how well the apple industry is working for the protection of the public.

Mr. HORAN. I am sure you are going to get a very clear picture of it.

Dr. MILLER. That is all, Mr. Chairman.

Dr. HEDRICK. Anything else?

Mr. HORAN. No.

Dr. HEDRICK. Congressman Jones?

Mr. JONES. No questions.

Dr. HEDRICK. Mr. Kleinfeld, do you want to ask anything?

Mr. KLEINFELD. I just have a few questions.

Dr. HEDRICK. All right, sir.

Mr. KLEINFELD. Major Chase, on page 2 of your statement you mentioned the study made by the Public Health Service, and you stated that that study was described by Dr. Kehoe, director of the Kettering Laboratory, as being one of the most thorough and complete studies he had ever had knowledge of. Do you know whether that remark or statement by Dr. Kehoe has ever been published, or has ever appeared in any publication?

Mr. CHASE. I do not. I know that it was made. I got it from several sources, and I got it from him personally. Of course that means at that time in 1940. There may have been greater studies and better studies since then; I do not know. That was his statement at that time. Whether that is in published form or not, I do not know, and I am quite sure that he will recall it, and undoubtedly if he did, he would be glad to place it in any form you want it. He is a very fine gentleman and a very fair man in every way.

Mr. KLEINFELD. Dr. Kehoe has testified before this committee.

On page 6, Major Chase, you say that you believe that "the Food and Drug Administration should be an enforcement agency only in enforcing rules and regulations."

Now, isn't it true that there are many other Government agencies, in fact, probably most Government agencies, which promulgate regulations and also enforce these same regulations? Is it not true that the Insecticide Division of the Department of Agriculture, for example, issues regulations, approves or disapproves labels, decides on toxicological work submitted to it, and then enforces the Insecticide Act and the regulations it has issued under that act?

Mr. CHASE. It is my understanding that they do not actually approve the use of it, but their passing on the label requirements acts as the same thing.

Mr. KLEINFELD. It amounts to the same thing; does it not?

Mr. CHASE. Yes. And they undoubtedly have enforced provisions of it.

Mr. KLEINFELD. In other words, they enforce the Insecticide Act just as the Food and Drug Administration enforces the Food and Drug Act?

Mr. CHASE. And I think the State agencies have power in the State in connection with the enforcement of law with what insecticides may be used. I think they follow quite generally the Department of Agriculture in their determinations, but I think they also have the authority to grant permission too, without the consent of the Department of Agriculture. I doubt if that is done but Mr. Shaw, who is here and thoroughly familiar with the State laws, would have the final answer on it.

Mr. KLEINFELD. The only thing I'm trying to point out is that it is by no means unusual for a Federal or State agency to promulgate regulations and also enforce the regulations; that it is a fairly well settled pattern of government, and that it is not limited to the Food and Drug Administration.

Mr. CHASE. Yes.

Mr. HORAN. I would like to challenge that, Mr. Counsel. I do not think the police department of Spokane sets up the statutes of be-

havior that they enforce. So I would not say it is a matter of precedent, that enforcing agencies prescribe the matters of conduct that have to be followed. So I just have to challenge, on the basis of political science, the statement that it is not unusual for an enforcing agency to write laws. I think you must agree with me.

Mr. KLEINFELD. In the case of a so-called common crime like kidnaping or robbery, that is true, but in the field of administrative law, you have both in the Federal and State governments agencies setting up regulations and enforcing them.

Mr. HORAN. If that is the precedent, let's stop it right now.

Mr. KLEINFELD. I am not saying it is right or wrong. I am only making the point that this procedure is not limited to any one agency. There are many agencies in the Federal Government which have been specifically empowered by Congress to make and enforce regulations and where Congress also has said "Before you transmit cases to the Department of Justice for prosecution you will do the investigative work."

Mr. HORAN. If they exist—and I agree with you they do—that is a matter of weakness in our society, when we have an enforcing agency prescribing the rules which they are going to enforce.

Out of our experiences we have sought an impartial agency that can find out whether or not a tolerance is detrimental to the public health or whether it is not, and we do not find that kind of attitude on the part of the enforcing agency. But your man of science, given freedom of action, says, "What is deleterious to the public health?" And he follows a broader scheme. Do you see what I mean? This is very vital to the people who produce fruits and vegetables. It is not restricted to the State of Washington by any means; it is all over the Nation. We want an impartial fact-finding body, and we want them to turn the facts over to those who will enforce those facts as they see them. It is a weakness in our society when we say—well, it is not a weakness, it is a threat to our society if we give powers of determination to enforcement agencies.

Mr. KLEINFELD. I was not thinking of this particular instance, Congressman. I was just thinking of the fact that the Congress has chosen in the past to do just this thing with many other agencies. As a matter of fact, there are two points to be made: One, that the actual enforcement in the last instance is done by the Department of Justice, not by either the Department of Agriculture or the Food and Drug Administration. There is that check and balance between any administrative agency and the producer.

Mr. HORAN. After findings of fact.

Mr. KLEINFELD. After preliminary determination by the agency.

Mr. HORAN. Yes. What I think we are dealing with is how are we going to arrive at the determination of the facts. That is what we are really after.

Mr. KLEINFELD. This procedure is not limited to the Food and Drug Act. For example, in the Department of Agriculture there is the Meat Inspection Act and the meat inspection people determine whether a certain chemical shall be used in a meat product. If it is used, the meat inspection people enforce the law.

Similarly, the Securities and Exchange Commission decides whether a certain stock issue shall be permitted issuance, and then enforces the law if there is a violation. You have the Federal Communications

Commission which determines whether a radio station or TV station shall be given a certain channel, and if the rule or regulation is not observed, the FCC institutes enforcement proceedings.

It may or may not be a weakness in the law, that is for the Congress to determine, but it is an over-all basic thing in our society and is not limited to any one agency or law. That is the only point I am making.

Major Chase, in our informal discussions yesterday, I mentioned that Dr. Griffin, of the Insecticide Division of the Department of Agriculture, had appeared before this committee. He made several recommendations to this committee, and I would like to get your reactions to them.

Dr. Griffin said at page 558 of the current hearings:

> While the Federal Insecticide, Fungicide, and Rodenticide Act affords far greater protection to the public than the Insecticide Act of 1910, there are certain portions of it which are not as strong as might be desired.

He stated that—

> Section 4 (a) (4) provides that the material filed in connection with the application for registration shall include if requested, a full description of the tests made and the results upon which the claims are based. This does not sufficiently require that adequate tests be made and place the responsibility upon the applicant to prove the safety and effectiveness of his product.

He said:

> The law would be much stronger if the applicant was required, in those cases where the information was not otherwise available, to bear the burden of proof of the effectiveness and safety of his product for the uses intended. As a prerequisite to registration, he should be required to carry out adequate testing, both as to possible toxicity hazards and effectiveness, and include with the application a complete report of results of such tests.

Do you agree with the recommendation made by Dr. Griffin?

Mr. CHASE. I would agree. You understand I am not qualified from a legal standpoint to reply, but from just a practical viewpoint, it seems to me his recommendation is correct—where information is not available that is authentic and satisfactory to the Department, then I think the manufacturer should be the one who necessarily supplies that.

Mr. KLEINFELD. In other words, should not the burden be on the manufacturer to prove the product is safe?

Mr. CHASE. I think so.

Mr. KLEINFELD. And Dr. Griffin indicated that he thought the Insecticide Act would be strengthened by a specific requirement to that effect. You have no quarrel with that recommendation, sir?

Mr. CHASE. None at all.

Mr. KLEINFELD. He made a second recommendation. Dr. Griffin stated that though the provision for registration under protest has not up to the present time caused difficulties, "it is quite conceivable that a manufacturer might desire to apply an economic poison on food crops in a usage which was not considered safe and demand registration under protest, which would have to be granted."

Dr. Griffin said the law would be stronger if the provision for registration under protest were omitted. Now what is your thought on Dr. Griffin's recommendation to that effect?

Mr. CHASE. Of course, it seems to me that if they are permitted to register insecticides under protest, they are sticking a big red flag of

warning right up, that there is something wrong about it, and it is hard for me to conceive that a reliable manufacturer would want to have his product used on a registration that was under protest. I think it could be stricken from the law. It seems so to me from a layman's viewpoint.

Mr. KLEINFELD. We are trying to get the opinion of laymen and not of lawyers. We are keeping away from lawyers as much as we can.

Mr. CHASE. I doubt very much if anything like that would be permitted to be used in States where they have pretty general supervision, if disapproved by the Department of Agriculture or registered under protest.

Mr. KLEINFELD. The last recommendation made by Dr. Griffin in testifying before this committee was that the chemical manufacturer, the manufacturer of the insecticide or pesticide, should be required to submit to the Insecticide Division, with his other data, methods of analytical determination so that the food processor or canner could have before him when he purchases his fruits and vegetables methods of analysis to determine which insecticides were present and the quantities thereof. The Insecticide Act does not so require at the present time. Would you also be in accord with Dr. Griffin's recommendation to that effect?

Mr. CHASE. I would, because I don't understand how you can determine whether it is poisonous or not, unless you can have some method of determining what is on the products, whether it be apples or vegetables or something else.

Mr. KLEINFELD. Dr. Miller asked you, Major Chase, a question with respect to the tolerances, if any, in the State of Washington. Does the State, as far as you know, establish definite tolerances for insecticidal spray residues, and do they differ from the Federal tolerances?

Mr. CHASE. Well, you have an expert here on that. I will give you my opinion subject to change by him. It is my opinion that our present law insofar as residue on fruits, at least, and possibly vegetables, requires that they be visibly clean. I think——

Mr. KLEINFELD. It does not set up specific tolerances?

Mr. CHASE. No. California sets up the same as in the Federal statutes, and if the Federal people are slow in determining a tolerance, they can pass it as a State law. I think they are ahead of the Federal Government in determining tolerances for their fruits and vegetables in California.

Mr. KLEINFELD. The State of California?

Mr. CHASE. Yes.

Mr. HORAN. Off the record.

(Discussion was continued off the record.)

Mr. KLEINFELD. Major Chase, were you able to read the testimony before this committee of Mr. J. T. Sanders, legislative counsel of the National Grange?

Mr. CHASE. I read that rather hurriedly early in the proceeding. I think that was one of your first witnesses, as I recall, earliest witnesses.

Mr. KLEINFELD. He was one of our witnesses this year.

Mr. CHASE. I do not recall it too clearly, but I know that I read it through.

Mr. KLEINFELD. He believed, and so stated before this committee, that a number of changes could be made in the existing law. I think

the committee gave his recommendations considerable consideration because he appeared on behalf of a farmers' group which, of course, is very much concerned with any such legislation. I would like to get your views on those recommendations.

For example, Mr. Sanders said he would like to outline the basic requirements of the new legislation which the National Grange proposes, and these basic requirements were as follows:

1. Adequate information on acute and chronic toxicity of the pesticide under consideration.
2. Suitable methods of analysis for determinations of residues at harvest time.
3. General information on the amount of residue to be expected at harvest time on the edible portion of the product on which the pesticide is used.
4. Recommendations for economical removal of excessive residues based on the known chemical and physical properties of the pesticide as formulated and the farm product on which it is used.
5. Information on the effect that tolerances lower than the safety tolerance will have on agricultural production and profits.
6. Requirement that the National Pesticide Commission—described later—shall set a tentative tolerance without formal public hearing within 90 days after the pesticide has been registered for use by the United States Department of Agriculture under the Federal Insecticide Act.
7. Requirement that the National Pesticide Commission, as soon as practical after tentative tolerances are set, shall arrange for adequate sample analyses of interstate shipments of farm products on which the pesticide was used, or of foods processed from such farm products, and if pesticide residues in excess of the tentative tolerance are found, shall issue warnings to the producers in the area concerned.
8. Requirement that at the earliest practicable date after a tentative tolerance is set, but not to exceed 18 months, the National Pesticide Commission shall institute public hearings for the purpose of setting a final tolerance and shall pronounce such final tolerance as soon as practical after concluding the hearings.

What would your reaction be to those recommendations of the National Grange, Mr. Chase?

Mr. CHASE. Without careful study and without flaws being pointed out to me, which I have not had done, my offhand opinion is that the producers would agree with those suggestions, and they would be a great improvement on a lot of the procedures we have had in the past, because, you will recall, our Food and Drug Act called for hearings and was set up and became a law in 1938, and we have only had up until a year ago January one hearing and that was on fluorine. And the hearing in January has been over for some time and we still have not had any results from it.

Anything that would let the producer know where he stands at the quickest safe interval would be of exceptional benefit to the producers, in my opinion.

Mr. KLEINFELD. The Grange also recommended that there be created a three-man commission to be known as the National Pesticide Commission, to be composed of one top-ranking physical scientist from the Agricultural Research Administration of the Department of Agriculture; one scientist from the Food and Drug Administration; and one from the Public Health Service. The function of this Commission would be to determine policies, to make decisions as to the research needed to test a new product, and so forth. What would be your thoughts on such a Commission, Major Chase?

Mr. CHASE. Well, if they had in mind that Commission's directing research, more or less determining what was being done here and arriving at conclusions and all, this seems to me as though it would

be very beneficial. I do not understand, they propose that this Commission would conduct studies and determine tolerances themselves. My idea is they are going to direct this or assemble it or try and keep it on practical lines.

Mr. KLEINFELD. In addition, Mr. Sanders said that the National Pesticide Commission "would set tentative and final tolerances, but in case of disagreement and since two members of the Commission are under the Federal Security Administrator, he should have a veto over decisions of the Commission."

In other words, this three-man Commission would establish tentative and final tolerances after considering the data I mentioned a few moments ago. That seems to be a sort of compromise which Mr. Sanders, on behalf of the Grange, recommended. Have you any opinion on that?

Mr. CHASE. That is placing a tremendous power in three men, and those men are changeable very, very suddenly. A man may die, he may retire, or something like that. That Commission may be changed quite rapidly. I am just wondering if you want to put that much power in just three men.

Mr. KLEINFELD. Don't you have to put that power in someone?

Mr. CHASE. Well, if you put it in a Government agency like the Public Health Service or Food and Drug, we will say, the final outcome, of course, is the Administrator of the Federal Security Agency, but the men who are working this out are far more than three men; they are a tremendous group of men.

Mr. KLEINFELD. These three men, of course, would represent all the facilities of the Department of Agriculture, the Public Health Service, and the Food and Drug Administration. They certainly would represent a wider body of experience and data than any one agency such as the Public Health Service, or the Department of Agriculture, or the Food and Drug Administration.

Mr. CHASE. I would prefer it over our present system unquestionably. I can see where maybe placing the power in three men might sometime not work out the way they expected it to. But that is still getting quite a ways over my head.

Mr. KLEINFELD. Of course, the people in charge of a governmental agency may die or retire. But is not that the chance you take with any agency or, I suppose, with any business whose administration may change from time to time? Don't you agree that somebody should have the job of determining tolerances.

Mr. CHASE. Yes.

Mr. KLEINFELD. Mr. Sanders suggests the Commission as a body to diffuse responsibility and place it within three different agencies rather than in any one, and the Commission would establish and recommend various research projects the results of which would eventually provide the basis for both tentative and final tolerances.

Mr. CHASE. I think we would get much faster action that way, and I think it would be fine as long as it was satisfactory. When something occurred that was not—then, of course——

Mr. HORAN. We virtually have that sort of Commission now. The Federal Security Administrator is boss of both the Public Health Service and the Food and Drug now, and the Secretary of the Department of Agriculture would be the final voice in a PMA decision on labels. And, of course, you have the Department of Justice who are

the final word in the enforcement of this regulation. Actually, when you follow a procedure involving a determination of the liabilities involved in any insecticide that requires labeling in any shipment, you will find if it goes far enough it will contact all three. Of course, you will find this, also, that when you got into the office of the Federal Security Administrator in cases of jurisdiction between Food and Drug and Public Health, you will find him with his hands tied because he does not want to incur arguments between Dr. Dunbar and Leonard Scheele. It happened to me because I have problems involved there.

What Dr. Sanders is really pointing out is a procedure that would require the Federal Security Administrator to act, which he does not do now in the case of an argument. He does not have to. There is no law that says he has to.

Dr. HEDRICK. Congressman, just a minute. We have four additional witnesses here today and we must hurry along.

Are you through, Mr. Kleinfeld?

Mr. KLEINFELD. I am.

Dr. HEDRICK. Do you have any other statement to make, Major Chase?

Mr. CHASE. No, sir.

Dr. HEDRICK. Do you want to ask anything more?

Mr. HORAN. No.

Dr. HEDRICK. Thank you very much, Major.

Mr. CHASE. Thank you.

Dr. HEDRICK. Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Is Mr. Overley here?

Mr. OVERLEY. Yes.

(The oath was administered by the chairman.)

Dr. HEDRICK. Do you have a prepared statement?

Mr. OVERLEY. I do.

Dr. HEDRICK. All right, sir. Make it as brief as you possibly can. You may read sections and discuss them, whatever procedure you think would be quicker.

Mr. OVERLEY. I would prefer to read it if I may.

Dr. HEDRICK. Go right ahead.

Mr. OVERLEY. I suppose you want my name and a little history?

Dr. HEDRICK. Yes, if you please.

TESTIMONY OF FRED L. OVERLEY, HORTICULTURIST, TREE FRUIT EXPERIMENT STATION, STATE COLLEGE OF WASHINGTON, WENATCHEE, WASH.

Mr. OVERLEY. My name is Fred L. Overley. I was reared on a farm in eastern Iowa; completed common schools and attended Iowa State College at Ames, majoring in horticulture; graduate with a B. S. degree in 1912; completed graduate work and received M. S. degree in 1916. I was instructor and assistant professor of horticulture from 1912 to 1917 at Iowa State College; county agricultural agent, Freemont and Warren Counties in Iowa, 1917 to 1923. In September 1923, I accepted a position as assistant professor of horticulture at Washington State College at Pullman, Wash., and was transferred to Wenatchee in 1927 to conduct and take charge of experimental work

for the Agricultural Experiment Station of the Washington State College in that area.

I was superintendent and horticulturist of the Tree Fruit Experiment Station at Wenatchee until my retirement. Our experimental work was on fruit production problems, including spray injury to fruit and trees as related to the control of insects and diseases, fertilizers, orchard cover crops, spray residue, and related problems.

I have been a member of the spray residue committee of the Wenatchee Valley Traffic Association for a number of years, a member of the Washington State Horticultural Association residue committee and chairman of the residue committee of the American Pomological Society Committee for the past 2 years. The members of the American Pomological Society Committee in addition to the chairman are: Dr. T. J. Talbut, College of Agriculture, University of Missouri at Columbia; Dr. Martin Barnes, Citrus Experiment Station, Riverside, Calif.; Dr. E. H. Smith, New York Agricultural Experiment Station, Geneva, N. Y.; Dr. J. H. Cochran, Clemson, S. C.

I was assigned to the spray residue project for the experiment station immediately following the first report from London in late 1925, that excessive residues of arsenic were found on fruit shipped from Washington State. Work was continued on this problem for a number of years helping to develop equipment and washing solutions for the removal of residues. I was a witness at the fluorine hearing in Washington, 1944, and later a witness in the 1950 hearing on the matter of tolerances for poisonous or deleterious residue on or in fresh fruits and fresh vegetables. My statement and evidence presented at that hearing may be found on pages 981 to 1086 inclusive in the report of that hearing. My testimony in that hearing was first concerned with the importance of fruit and vegetables as agricultural products for the State of Washington. Values were given for apples, pears, prunes, respberries, peaches, apricots, grapes, loganberries, cherries, strawberries, cranberries, hops, and potatoes all of which are grown with the use of chemicals.

In 1948 the value of apples, peaches, pears, and apricots alone was well over $100,000,000 for the State of Washington. The total amount of apples packed in the State of Washington is one-third to one-fifth of the Nation's crop.

The second point of my testimony dealt with the development of a Washington State spray program. The program has undergone changes as new insecticides have been developed. Some of the early insecticides such as the arsenates, cryolite, nicotine bentonite and various oils caused fruit and plant injury. They also resulted in some undesirable residues on the fruit, and washing experiments were carried out with varying success to reduce these residues within permissible limits.

In 1944 new chemicals such as DDT were used with better results. In 1945 DDT was used in greater amounts and when used gave the best control of the codling moth that had ever been obtained. DDT residues varied with types of application—in some cases the residues were less than 7 parts per million and in other cases they were more. In 1947 DDT and selocide gave excellent control of codling moth but not of the mites.

Dr. HEDRICK. Right at that point, do you think the moth builds up resistance against DDT the same as the housefly?

Mr. OVERLEY. Well, we do not know. I do not think that we have used the material long enough to really know.

Dr. HEDRICK. I see.

Mr. OVERLEY. DDT in combination with parathion also gave excellent control of the codling moth and mites. Other new insecticides are still undergoing test. The newer insecticides such as DDT and parathion have since resulted in cheaper spraying costs and yet have produced better fruit-production results. They can be applied fewer times and do not cause plant or foliage injury such as the arsenates. DDT may cause some soil toxicity and experiments are continuing in an effort to overcome this problem.

It should be emphasized that the economy of the fruit industry of the Northwest, and of the whole Nation, is directly related to the use of chemicals in the forms of pesticides and fungicides. A sudden banning of the use of chemicals or a very limited usage of chemicals in fruit production, would seriously cripple this phase of our agricultural production. For 50 years or more chemicals have been used by the farmers of the Nation for the control of more harmful insects and diseases that are continually at work on all forms of plant life. Prohibitive regulations on the use of the chemicals that have been discovered in the past, for the control of the insects and diseases would result in the wiping out in a short time of the tree fruit industry, the vegetable industry and the small-berry industry to mention only a few. The use of chemicals are essential if good high quality insect and disease-free produce is to be made available to the consumer.

With your permission I would like to show a few apples here.

Dr. HEDRICK. Yes, sir.

Mr. OVERLEY. I have two lots of fruit here. One lot contains a very beautiful apple but it is a cull apple because the sprays were not sufficient to control the insects.

Here are a few apples that show the effects of codling moth, and these are all culls.

Here is an apple that shows scab, which most of the eastern people know about, but we are having trouble with it in the Northwest for about the first time. It takes only a mark or two of these insects or diseases to cull the fruit and make it worthless as far as putting it on the market.

Dr. MILLER. Doctor, what concentration of DDT must you use to control the codling moth?

Mr. OVERLEY. I am not able to give that right offhand.

Dr. MILLER. You do not know what is used?

Mr. OVERLEY. No. Not the concentrations now in use.

Dr. MILLER. You know what is used but not how much is used?

Mr. OVERLEY. The strength varies from season to season. I have not been too close to the program this last year.

Dr. MILLER. What steps are taken to see that the DDT does not stay on the apple?

Mr. OVERLEY. The steps taken are the washing of the fruit and chemical analysis at harvest time.

Dr. MILLER. What quantity is permissible after it is washed?

Mr. OVERLEY. Seven parts per million of DDT.

Dr. MILLER. Are you familiar with the tests carried on by Mr. Dendy in Texas relative to DDT in milk and meat?

Mr. OVERLEY. I have heard of it, but I am not too familiar with it. This apple here is covered with San Jose scale. Here are some apples that have been properly taken care of with our spray program, and these apples are all apples that will go onto the market without any question as far as we know. But without the spray programs the product is worthless as far as marketing it, and I am sure that the consumer would not care for fruit in this poorly sprayed class as compared to this other lot of well cared-for fruit.

Fruit production is the major industry in the Wenatchee and Yakima areas of the State of Washington. The largest percent of the population is supported by fruit, either the growing or handling directly or indirectly, or through the manufactured products necessary in the production and handling of the fruit. The railroads and truckers profit from the hauling of the fruit to the markets and the suppliers back to the area. The fruit containers or boxes cost the grower around 45 cents per box.

Apples make up the greatest tonnage of any of the fruits produced in the area. Wenatchee area shipped and processed in addition to local consumption in 1948–49, 18,185 carloads; 1949–50, 20,303 carloads; 1950–51, 22,625 carloads. This is just for the Wenatchee and north central area.

I do not have the latest figures for Yakima, but in 1948–49 they had 10,068 carloads. During the 1948–49 season the total shipments of apples for the State of Washington exceeded 22 million boxes. Washington's production of pears in 1946 was 8,890,000 bushels; and in 1949, following a winter of severe freezing, the State produced better than 7,000,000 bushels. During 1948–49 season the Wenatchee area produced over 1,000 cars of the soft fruits such as cherries, apricots, peaches, plums, and prunes. The production was reduced during 1950 and 1951 because of severe winter and frost injury to the trees. Figures were not available to me, but a greater tonnage of soft fruits is produced in the Yakima area.

The use of pesticides has become a common practice with our fruit growers. The materials used and their methods of use is generally suggested and directed by the field men of the various grower organizations and the county agricultural agents of the different counties.

The recommendations to the growers for the use of the pesticides first comes from the research workers of the USDA and the different State experiment stations. Since 1926 the research workers of the USDA, the States of Montana, Idaho, Oregon, Washington, Utah, Colorado, and California, and of British Columbia, in Canada, have met annually about the first of the year for a 3-day conference. The results of all insect-control work and the experiments with the use of the different chemicals are thoroughly discussed from the standpoint of insect control, injury to plants, and its toxicity in relation to men, animals, and beneficial insects. The results of this meeting are compiled into a report entitled "Report of the Western Cooperative Spray Project Conference." A copy of the report for 1951 is available for entry as an exhibit if it is desired. I have copies of this if any of you are interested in looking at this conference report.

In this report there are recommendations made that are taken up by the different States in formulating their spray recommendations to their growers.

Dr. HEDRICK. Thank you.

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Mr. OVERLEY. These suggestions are published and used by the different States as a basis of developing spray recommendations for their respective areas for the coming season. The recommendations for the State of Washington are completed after this meeting by research workers of the agricultural experiment station, county agents, and inspectors of the State department of agriculture. Nothing is put into these recommendations unless it has been proven experimentally satisfactory, and has been proven generally safe to use from the standpoint of the grower and the consumer. If precautions are necessary, they are incorporated in the recommendations.

Generally speaking, quantities of materials that would be toxic to man and animals are often toxic to plants and soil, and their uses are limited. For example, when lead arsenate was used for codling-moth control, regulations were placed on the manufacturers so that the product could not contain more than 0.5 percent soluble arsenic.

This was a protection measure because more than that amount was found to be toxic to foliage of fruit trees. Some growers felt that arsenic was the material in the compound, lead arsenate, that caused the killing of the insects. They would then add "white or soluble arsenic" from the drug stores and include this in their sprays. The result was serious, as it resulted in severe burning and almost total defoliation of the trees.

Mr. HORAN. Might I point out there that the thing Mr. Overley is talking about when he says "white arsenic" is this: that is the term we apply to arsenic, and it should be differentiated between arsenate of lead, which is a deviation from white arsenic, which is the pure arsenic, and it was used at certain times, but not as far as I know with the blessing of anyone in position of authority in the advising of growers. Now, we never used it on our property.

Mr. OVERLEY. I know our station and those in authority recommended against its use, but the growers insisted on using it.

Mr. HORAN. Arsenate of lead is something else. That is the pesticide. Arsenate of lead is not to be confused with the term "arsenic."

Mr. OVERLEY. This practice was immediately dropped. Growers are convinced that DDT used in excess may cause their soil to become unsuitable for plant growth, as did the excessive use of lead arsenate. Parathion used in excess will cause burning of fruit and foliage.

The summary of a paper presented by three of our station research workers—Ackley, Walker, and Benson—on DDT residues in Washington soils, states:

> The results of this study indicate that DDT accumulation in the surface soil, under orchard condition, is highest under the spread of the trees.
>
> With DDT spray program, DDT accumulates rapidly during the first year or two, but thereafter the accumulation may be much reduced.
>
> Beyond certain minimum concentrations, DDT in the soil is toxic to plants growing in that soil. The degree of toxicity is related to the type of soil under test. Commercial DDT is more injurious to plants than purified DDT. Apple trees appear to be very tolerant to soil DDT.

I have copies of this reprint here with this summary I have just read if you are interested.

When these different materials are used according to recommendations of the research men, in restricted and limited quantities necessary for insect control and with the necessary precautions, the possible injury to man, animals, beneficial insects, and plants is reduced to a minimum.

The growers have complied with the Administration tolerances for spray residues placed on their fruit since 1927. They have made every effort to meet all the regulations, even with the first tolerances, that were first imposed, which were found much lower than necessary and later raised to what was considered a safe tolerance.

The Administration tolerance was first set on arsenic at 0.01 grain per pound of fruit and later increased to 0.025 grain per pound of fruit. The lead tolerance at one time was 0.018 grain per pound of fruit and later finally increased to 0.05 grain per pound of fruit. Fluorine started with a tolerance of 0.01 grain per pound of fruit, but was finally increased to 0.05 grain per pound of fruit. It cost the growers and the industry great sums of money, extra labor, and a lot of headaches and heavy fruit losses to meet these early tolerances which were later proven unnecessary and changed.

At the present time, from the results of experimental work and thousands of analyses, the growers know that they should not apply parathion less than 30 days from harvest, as it requires 20 to 30 days for the material to dissipate from the fruit or plant.

DDT should not be used within 30 days of harvest, in order to market fruit with a residue load below the present Administration tolerance of 7 parts per million. Mr. Walker, former chemist of the Tree Experiment Station, has run thousands of analyses determining the residues on fruit from the spray program before and after washing in our fruit-packing plants.

Dr. MILLER. Mr. Chairman, I would like to ask Dr. Overley about the use of parathion 20 or 30 days before harvest and DDT 30 days before harvest. Is that what the law requires or is it just a recommendation?

Mr. OVERLEY. That is a recommendation.

Dr. MILLER. Do some of them use parathion or DDT, say 10 or 12 days before the time of harvest?

Mr. OVERLEY. To my knowledge, the growers follow our recommendations very religiously.

Dr. MILLER. Tell me this: Do the cattle sometimes graze in these orchards to pick up the grass?

Mr. OVERLEY. They are not supposed to. If they get in, they break in.

Dr. MILLER. Does that include dairy cows and so forth?

Mr. OVERLEY. They are not supposed to.

Mr. HORAN. No; that is not a practice. It is true if a cow grazes on foliage or vegetation below a sprayed tree it will show up in the milk.

Dr. MILLER. That is all I was trying to get at. The experiments carried on in Texas show that DDT showed up in cows' milk and would be passed on in considerable proportions even with the very small amount of DDT that was being used.

I am still concerned with, and hope somebody can give me an answer to, the question of how much DDT on the apple is permitted when shipped out of the State, or sold within the State. I hope someone can give us the answer.

Mr. OVERLEY. I think you have a witness coming up who can answer that question.

Dr. MILLER. All right.

Mr. OVERLEY. None of the chemicals or combinations of chemicals now in use are entirely satisfactory for all the purposes they are needed. Our research man in the USDA and the different State experiment stations are continually working with new materials and new combinations of materials, hoping to find some program more satisfactory for insect and disease control but less injurious to fruit and foliage, and less toxic to man, animals, and beneficial insects. The research departments of our chemical companies are working along the same lines. As the result of this research, new materials and combinations of materials are suggested for further field trials each year.

It was only a few years ago we were concerned with tolerances for lead and arsenic and had the problems of residues and washing. Fluorine followed with its problems of tolerances. Now, neither one of these materials is used to any extent in fruit-insect control, but we are using DDT and parathion with other materials and combinations being tried out. Neither DDT nor parathion is entirely satisfactory.

The Public Health Service has established a branch laboratory at Wenatchee and are working on the residues and toxicity of the different chemical sprays that are now in general use. I am sure in a short time they will have the best availabile information on how these different chemicals necessary in the production of fruit can be used with safety by the spray-machine operator and the fruit grower, without any chance of injury to the general public either by the use of the sprays or through the consumption of the fruit. After working closely with the fruit industry of this State for nearly 30 years, I have heard of no one getting sick from eating fruit because of residue, but I do know of youngsters getting the stomach ache from eating green apples.

The Food and Drug Administration have made every effort to guard the consuming public by checking and placing tolerances on spray residues on fruit for interstate shipments.

It therefore would appear reasonable if additional legislation is needed to develop the following:

1. Give greater support to the research agencies of States and Federal Government in order that they can conduct more complete investigations on the need of the different chemicals and develop combinations for their use so that the grower can get control of his insects and diseases without any toxic effect to plants, man, or animals.

2. Give greater support and permit a wider field of investigation for United States Public Health Service to conduct in cooperation with the State and Federal research agencies; complete studies on the toxicity of all chemicals recommended and necessary to use in control of insects and diseases.

3. Give the Food and Drug Administration power to regulate the use of the materials that are considered harmful and toxic by the two above agencies.

Thank you.

Dr. HEDRICK. Does that conclude your statement?

Mr. OVERLEY. Yes, sir.

Dr. HEDRICK. Are there questions, Mr. Jones?

Mr. JONES. I have just one question.

Here on page 3, Doctor, in the middle paragraph, it says,

Nothing is put into these recommendations unless it has been proven experimentally satisfactory.

By whom?

Mr. OVERLEY. That is by the research workers who have conducted the experiments with these materials. They do not recommend the materials through the suggestions I handed out unless they are proven satisfactory from the standpoint of control when they are used.

Mr. JONES. Now, it was brought out here a second ago—and I want to elaborate on that a little bit—about the individual grower. While this group, through the station and through the county agricultural agent and so forth, gets recommendations, an individual may decide to use more lead arsenate, or something like that, and the fruit is shipped. Now, how would that show up as to whether he had followed a practice different from that recommended and in general use?

Mr. OVERLEY. Well, that would show up at harvest time. If his fruit contains greater quantities of these materials than the Administration tolerances allow, they would check it at that time.

Mr. JONES. When you say "they would check", do they check samples from every shipment going out from every producer?

Mr. OVERLEY. During the past years, when fluorine was used as sprays, practically every shipment was checked. They were required to be checked and analysis reported before they were allowed to be shipped out.

Mr. JONES. That was from every orchard?

Mr. HORAN. Might I interrupt there? We will see that, and I have asked them to make it very plain to us. Of course, I have not been real close to it since I have been in Congress, which has been about 10 years now, but when I was elected to Congress I was managing our packing plant, and we were required to put a code number on every lot, usually about 150 or 200 boxes. Sometimes we would increase that amount if we thought we were safe.

You see, we put that code number on and then the Federal-State inspection service would send a man out and he would—what we refer to as—"crack" so many boxes at random through this lot until he got, oh, a bag of apples, six or eight apples as a rule. Of course, then it is sent to a certified laboratory and the standard test is made at that time. At that time we were using arsenate of lead as an insecticide, and they would run their standard tests and get their findings as to their arsenate content and the lead content.

Of course, the point I make about being careful about the number of boxes in a given lot—if your findings come back and they are over the tolerances, we have to rewash them. In other words, you are just out what you have spent in packaging and packing, and so forth, and you have to rewash them. And when I saw that we would be very careful. If we had a lot of apples that we ourselves felt were hard to clean and might not meet the tolerance, we tried to keep the lot small. On the other hand, if we thought we were perfectly safe, we might allow the lot to be big. It is purely a matter of economics.

You will see how that is done by the fruit industry here day after tomorrow when we are in Wenatchee. Does that answer your question, Mr. Jones?

Mr. JONES. Yes.

That is all I have, Mr. Chairman.

Dr. HEDRICK. Are there other questions?

Dr. MILLER. Only this, Mr. Chairman: I notice in the report of the Twenty-fifth Western Cooperative Spray Project Conference of January 24, 25, and 26, 1951, you make certain suggestions for the control of orchard insects and mites and plant diseases for 1951. In these suggestions I presume you mention most of the diseases that are prevalent here, and refer, I notice, to the codling-moth control of from one to three applications of 2 pounds 50-percent wettable DDT. Also, for mite control, you speak about the use of parathion and suggest that it is dangerous to man and animals, and to read the labels.

And the EPN control of mites. You say EPN is highly toxic to man and animals, and every precaution given by the manufacturer should be used in handling the material, and so forth. There are several pages here of controls which are undoubtedly excellent. But you also say in the third paragraph [reading]:

> Present experimental information is not sufficient to permit specific suggestions for their use at this time.

I am wondering—these are merely suggestions. It could not prohibit a man from using parathion, for instance, in oil if he wanted to, on his apples. Then who determines what the tolerances shall be, whether it is parathion or DDT or some of these other pesticides that would be dangerous to human beings?

What I am concerned about is whether those tolerances are checked closely enough. You do not know enough about DDT and maybe you do not know enough about these others. If you do not, we will let somebody else answer it, but I want to find the answer, Mr. Counsel, as to who checks it and what the tolerance is of DDT and parathion and on these other things that are suggested that might be used in the production of apples and other fruits.

Mr. KLEINFELD. On the finished product there are informal tolerances, I believe, established by the Food and Drug Administration. That agency held hearings last year to establish formal tolerances.

For example, on DDT the informal tolerance is seven parts per million. It may be seven or five parts per million when the Food and Drug Administration comes out with regulations based on the spray-residue hearings of last year.

Dr. MILLER. I could see where regulations might be so stringent sometimes it would be almost impossible to grow apples like this, if you had to follow some of the regulations. I am wondering if there is some flexibility so they can use something that produces a nice apple, yet before it is shipped they can make sure it is properly processed and get the poison off it. The thing that bothers me is whether they are going to raise this kind of apple or that kind of apple [indicating].

Mr. HORAN. Is it possible to get a bill of lading out of the depot without a clearance from the Food and Drug?

Mr. OVERLEY. I am sure it wasn't a few years ago, but I am not too sure about the present time with DDT and parathion.

Mr. HORAN. We did have some problem at one time regarding truck shipments. It was impossible to get a bill of lading from the rail-

road when I was shipping, at least when I was active in it, without a State-Federal inspection slip as to grade and quality, and also a clearance slip from a certified laboratory that the fruit was free of residue.

Dr. MILLER. Was that true, also, of trucking?

Mr. HORAN. That was one of our problems. Perhaps Mr. Overley can answer that. We were working on it at the time. Because there was far more lenience, of course, in intrastate shipments, and so apples could go to Seattle and perhaps be transshipped there without a clearance.

Dr. MILLER. Of course, trucks come down into Nebraska with apples from Washington. I have seen them many times.

Mr. HORAN. That is right. I think I would be safe in saying that no apple out of the State of Washington is shipped any place but that has been washed.

Now the question arises then as to whether or not they were washed sufficiently to get clearance of the Food and Drug tolerance level. I would say that those that are not would be very, very much in the minority, as you will probably appreciate when you have seen the industry in action, which we will do day after tomorrow.

Mr. OVERLEY. May I add to that?

Mr. HORAN. Surely.

Mr. OVERLEY. Shippers are well aware of the fact that if they ship a car of apples out of the country and that car has a residue beyond the administrative tolerance they are subject to seizure and condemnation. I think that the shippers by being conscious of that fact are pretty well satisfied when they send out a car that it meets the present requirements.

Mr. HORAN. That will be made very obvious.

Dr. MILLER. That will be fine.

Dr. HEDRICK. Any other questions? Mr. Kleinfeld?

Mr. KLEINFELD. Just one question, sir.

Mr. Overley, on the last page of your statement you indicate that greater support should be given to the research agencies of the various State governments and the Federal Government so that they can conduct a more complete investigation. Suppose a chemical manufacturer comes out with a new insecticide. Let's say he came out with DDT now for the first time. Should not it be the primary responsibility of the manufacturer of the chemical to produce data as to its safety, as to the pharmacological and toxicological studies that have been made, before submitting it for the approval of an agency or for further research by an agency?

Mr. OVERLEY. Well, I think in most cases the chemical companies do work out——

Mr. KLEINFELD. Shouldn't they do that?

Mr. OVERLEY. I think that they should on any new material that comes out. They should have certain tests made—well, they should know.

Mr. KLEINFELD. So the primary responsibility should be on the concern which brings out the insecticide and wants it placed on the commercial market?

Mr. OVERLEY. It should be, before it is recommended for use.

Mr. KLEINFELD. Before it is recommended for use?

Mr. OVERLEY. Yes.

Mr. KLEINFELD. I have no other questions.

Dr. HEDRICK. We thank you very much for your appearance before the committee.

Mr. OVERLEY. Thank you.

Mr. HORAN. I might say that Mr. Overley is one of our real experts in the apple-production field. We are very proud of him.

Mr. OVERLEY. Thank you.

Dr. HEDRICK. I think you are exteremely lucky to have him.

Mr. KLEINFELD. Is Mr. Walker here?

Mr. WALKER. Yes.

(The oath was administered by the chairman.)

TESTIMONY OF KENNETH C. WALKER, WENATCHEE, WASH.

Mr. KLEINFELD. Mr. Walker, what is your background in the insecticide business?

Mr. WALKER. I have a prepared statement if that will suffice.

Mr. KLEINFELD. Does that include your background?

Mr. WALKER. My background consists of having worked actively in insecticides since 1943.

Mr. KLEINFELD. You may read your statement.

Mr. WALKER. My name is Kenneth C. Walker, 219 North Miller Street. I am appearing at this hearing as a private citizen representing the State College of Washington.

The testimony I shall present will be on information gathered while in the employ of the State College of Washington from September 20, 1943 to June 4, 1951.

The following testimony is a condensation of a series of exhibits entered in the matter of tolerances for poisonous or deleterious residues on or in fresh fruits and fresh vegetables held before the Administrator of the Federal Security Agency in Washington, D. C., as recorded in docket No. FDC–57.

For the presentation of this testimony I have divided the information into three categories or classifications, namely:

1. Spray residue surveys of the industry, 1943 to 1949, inclusive.
2. Spray residue removal studies, 1943 to 1949, inclusive.
3. Spray residue studies of experimentally sprayed fruits, 1943 to 1949, inclusive.

Part 1: During the harvest and packing seasons, 1943 to 1949, inclusive, samples of apples and pears were collected, for spray residue analyses, at many different commercial packing organizations. The samples to be analyzed for lead arsenate or fluorine were collected from the marketable washed fruit after it had been washed, sorted, sized, and was ready for packing. The samples collected for DDT and parathion spray residue analysis were collected from the so-called marketable washed fruit after it had been washed, sorted, sized, and was ready for packing. The information gathered over this period is summarized in the following table.

Do you wish me to read you the table?

Dr. HEDRICK. No; we will just put it in the record.

(The table referred to is as follows:)

A summary of the spray residues found on commercial fruits

	Number of samples	Percentage of samples			Exhibit No.
		0.0 to 0.05 grains per pound	0.05 to 0.10 grains per pound	0.10 to 0.20 grains per pound	
Apples: Lead arsenate—					
1943	987	69.1	22.9	8.0	183-C.
1944	639	65.6	26.1	8.3	Not entered.
1946	55	83.7	12.7	3.6	Do.
Apples: Fluorine—					
1943	357	87.0	12.0	1.0	183-C.
1944	344	90.4	8.7	.9	Not entered.
1946	73	93.2	6.8	0	Do.
Pears: Lead arsenate—					
1943	95	82.1	12.6	5.3	183-C.
1946	4	75.0	25.0	0	Not entered.
Pears: Fluorine—					
1943	33	87.8	6.1	6.1	183-C.
1946	4	75.0	0	25.0	Not entered.
Apples: DDT—					
1946	14	57.1	42.9	0	Do.
1947	165	88.5	10.9	.6	184-B.
1949	992	96.9	3.1	0	184-K.
Pears: DDT—					
1947	14	100.0	0	0	184-B.
1949	115	98.3	1.7	0	184-K.
Apples: Parathion—					
1948	74	[1] 100.0	0	0	185-A.
1949	992	[2] 100.0	0	0	185-B.
Pears: Parathion—					
1949	115	[2] 100.0	0	0	185-B.

[1] Average of all samples was 0.040 parts per million.
[2] Average of all samples was 0.023 parts per million.

Mr. WALKER. Part 2: The removal of lead arsenate and/or fluorine spray residues from the surface of apples requires that the fruit be subjected to heated chemical baths. Experiments were conducted during 1943 to determine the effect of increasing the heat of the chemical baths on the efficiency of removal of lead arsenate and/or fluorine spray residues.

Duplicate samples of apples from experimental spray plots were washed in hydrochloric acid at different temperatures and also in sodium silicate washing solution followed by another wash in hydrochloric acid.

The following results were obtained: Fruit washed in 1.5 percent hydrochloric acid at 57° Fahrenheit had 70 percent of the lead arsenate and 68.5 percent of the fluorine removed. Increasing the temperature to 95° F. removed 87 percent of the lead arsenate and 87 percent of the fluorine. Treating the fruit in a two-unit bath of sodium silicate, 80 pounds per 100 gallons, at 110° F. and 1.5 percent hydrochloric acid at 100° F. removed 96.7 percent of the lead arsenate spray residue and 96.8 percent of the fluorine spray residue. This last treatment was the only one that removed sufficient residue to permit the fruit to be cleared as far as residue tolerances were concerned (exhibit No. 183-A).

Mr. HORAN. Might I ask there——

Mr. WALKER. Yes, sir.

Mr. HORAN. Is this a discussion of the findings of those tables which you have submitted for the record?

Mr. WALKER. No, sir.

Mr. HORAN. It is not?

Mr. WALKER. No, sir. The table is a summary of the surveys that we conducted in the industry from 1943 through 1949.

Mr. HORAN. I was just curious when you mentioned 96 percent of the spray residue on the fruit, it might be well for us to have some understanding of what the residue was that you were removing. Do you have that? Does that show in any of your records?

Mr. WALKER. If I understand your question correctly, you mean the magnitude of the residue?

Mr. HORAN. The amount of the residue on there before it was washed and when you removed 96 percent of it, what was the tolerance left?

Mr. WALKER. Well, when 96 percent of it was removed, the amount left was below 0.05 grains per pound.

Mr. HORAN. It was?

Mr. WALKER. Yes.

Mr. HORAN. I just wanted to get that clear.

Mr. WALKER. During 1944 experimental residue removal studies were conducted to determine the effect of adding odorless-tasteless light grade oil to the washing machines. Thorough residue removal had been accomplished in past seasons by removing the waxlike coating of the fruit. The removal of this coating shortened the storage life of the fruit considerably. Studies were conducted to see if the natural waxlike coating could be replaced with a very fine film of odorless-tasteless oil of low viscosity to prolong the storage life of the fruit and also to see if addition of oil would help in the removal of spray residue. Concentrations of oil from 1 to 5 percent in 1.5 percent hydrochloric acid at 95° F. failed to help the storage life of the fruit and did not aid in the removal of lead arsenate or fluorine spray residues (exhibit 183–B).

Experimental residue removal studies were conducted during 1946 to determine the efficiency of the usual washing practices on the removal of DDT spray residues, 1.5 percent hydrochloric acid at 100° F. removed an average of 17.8 percent of the DDT spray residue; 60 pounds of sodium silicate at 100° F. removed an average of 28 percent of the DDT spray residue; and a two-unit wash of 1.5 percent hydrochloric acid and 60 pounds of sodium silicate at 100° F. removed an average of 30 percent of the DDT spray residue (exhibit No. 184–A).

Dr. MILLER. Do you know what practices are carried on by the industry? Tell us what your experiments show, but also what practices are carried on by the industry to remove residue?

Mr. WALKER. This experiment, sir, was designed to reproduce the practices of the industry. Their washing consists of 1½ percent hydrochloric acid at roughly 100° F., 90 to 100, and sodium silicate at 60 pounds.

Our efforts here were to see what the washing practice of the industry would do in the way of DDT residue removal.

Dr. MILLER. All right.

Mr. WALKER. Experimental work conducted during 1948 indicated that the inclusion of petroleum oil in sprays containing DDT had harmful effects on the fruit and foliage and also increased the original deposit of DDT adhering to the fruit. DDT-oil combinations were found harder to remove from the surface of the fruit than were straight DDT sprays. Combinations of DDT and oil were tried in an effort

to find a suitable spray program that would control both codling moth and mites (exhibit 184–D).

Samples of 116 samples of apples sprayed with DDT during the 1949 season were checked both before and after washing. Samples were collected from 58 different commercial packing plants. The average DDT residue before washing was found to be 2.2 parts per million and the average after washing was 2 parts per million. Approximately 8.7 percent of the DDT spray residue was removed during the washing process (exhibit 184–F).

A considerable tonnage of the total yearly production of the apple districts of the State of Washington finds its way each year into the processing industry. Some of the processed apples are used in the production of applesauce. Experimental work was conducted in conjunction with processors in an attempt to produce an applesauce absolutely free of DDT. Strong caustic baths (2 to 2½ percent) at elevated temperatures of 85° to 210° F. (2 to 4 minutes) with long immersion times (2 to 4 minutes) was found satisfactory for removing surface DDT.

Apples carrying approximately 4 parts per million of DDT were processed under this plan and the finished applesauce was found to contain 0.09 parts per million of DDT. Anaylsis of the screen waste from the processing of the fruit revealed that most of the DDT was trapped with the peelings in the screens. The washing treatments employed completely scalded the apples and could only be used where the washed fruit was to be processed within 4 hours (exhibit 184–J).

Based on the theory that the DDT adhering to the surface of apples might be incorporated in the ursolic acid and the oily fractions of the skin surface experiments were conducted during 1948 to determine the effect of wetting agents and detergents on the removal of DDT spray residue. Various wetting agents and detergents were tested. None of the materials tested removed significant quantities of DDT from the surface of the fruit (exhibit No. 184–D).

Part 3: Lead arsenate is suggested for the control of cherry fruitfly on those cherries that are intended for processing only. Where 10 percent lead arsenate dusts were applied to cherries 30 days before harvest the lead arsenate spray residue at harvesttime varied from 0.002 to 0.039 grains of lead arsenate per pound of cherries. Where two cover sprays of 3 pounds of lead arsenate per 100 gallons of water were applied, the last one 30 days before harvest, the spray residue at harvesttime varied from 0.136 to 0212 grains per pound of cherries. When one cover spray at 3 pounds of lead arsenate per 100 gallons of water was applied 30 days before harvest the spray residue at harvesttime averages 0.131 grains of lead arsenate per pound of fruit (exhibit 181–A).

I might add that these were all unwashed cherry samples as they came from the tree.

DDT has been tested for the control of cherry fruitfly. On experimentally sprayed plots where one cover spray at 2 pounds of the 50 percent wettable powder per 100 gallons of water was applied 24 days before harvest the DDT spray residue at harvesttime varied from 0.6 to 1.3 parts per million. When one cover spray at 1 pound of the 50 percent wettable powder per 100 gallons was applied 24 days before the harvest the DDT spray residue at harvesttime varied

from 0.6 to 1.3 parts per million. When one cover spray at 1 pound of the 50 percent wettable powder per 100 gallons was applied 14 days before the harvest the DDT spray residue at harvesttime varied from 1 to 1.2 parts per million. When two cover sprays at 2 pounds of the 50 percent wettable powder per 100 gallons of water was applied, the last one 14 days before harvest, the DDT spray residue at harvesttime varied from 1.0 to 1.6 parts per million (exhibit No. 184–I).

Parathion was applied to soft fruits (cherries, apricots, yakamines, prunes and peaches) to determine the spray residue problem at harvesttime. Parathion applied to cherries at the rate of 1 pound of the 25 percent wettable powder 14 to 43 days before harvesttime resulted in a parathion spray residue of 0.08 to 0.30 parts per million. Where parathion, at 1 pound of the 25 percent wettable powder per 100 gallons was applied to apricots and prunes 14 to 72 days before harvest the parathion spray residue at harvesttime varied from 0.040 to 0.00 parts per million. One pound of 25 percent wettable powder parathion per 100 gallons of water applied to peaches 7 days before harvesttime gave a harvest residue of 1.6 parts per million. When this spray was applied to peaches 30 or more days prior to harvest the spray residue at harvesttime varied from 0.8 to 0.0 parts per million (exhibit 185–G).

Methoxychlor has been suggested for the control of cherry fruitfly. When 3 pounds of the 50 percent wettable powder per 100 gallons of water was applied to sweet cherries the residue varied from 7.7 parts per million 6 days after application to 0.4 parts per million 28 days after application. Methoxychlor as a 5 percent dust applied eight or more days before harvest left no detectable residue at harvesttime. Where 5 percent methoxychlor dusts were applied two days before harvesttime the spray residue was found to be 0.7 parts per million (exhibit No. 188).

Selenium, in the form of a potassium ammonium seleno-sulfide has been used experimentally for the control of orchard mites. Where no selenium bearing sprays had been applied to the fruit a trace of selenium was detected in and on the peel of Jonathan apples. Where one or more sprays of selenium-bearing materials were applied approximately 90 days prior to harvesttime the selenium residue on and in the peel of Jonathan and Delicious apples varied from 0.02 to 0.16 parts per million (exhibit No. 189).

Where parathion was applied to Delicious apples, at the rate of 1 pound of the 25 percent wettable powder per 100 gallons of water, 81 percent of the parathion disappeared from the surface of the fruit within 12 days after application. Where 4 pounds of 25 percent wettable parathion per 100 gallons of water was applied to Delicious apples 83 percent of the parathion disappeared from the surface of the fruit within 13 days after application; 94 to 100 percent of the parathion disappeared from the fruit within 30 to 32 days after application (exhibit No. 185–E).

Thank you.

Dr. HEDRICK. Does that conclude your statement?

Mr. WALKER. That concludes my testimony.

Dr. HEDRICK. Do you have any questions, Mr. Jones?

Mr. JONES. What effect does rain have on removing those spray residues, or is there any rain during that period?

Mr. WALKER. We are subjected to a small amount of rain during the growing period.

Mr. JONES. Does that apparently have any effect on removing residues?

Mr. WALKER. We could not detect any effect on DDT residues or parathion.

Mr. JONES. Where there was a variation, as to the number of days, what causes that? How does it disappear? What causes it to disappear?

Mr. WALKER. Are you referring to the dust or to the wettable powder? We have a problem in our area in getting dust to adhere to our trees.

Mr. JONES. For instance, here you said "when applied to sweet cherries the residue varied from 7.7 parts per million 6 days after application, to 0.4 parts per million 28 days after application." Well, in that period from the sixth to the twenty-eighth day, how does that disappear? Does it blow off or oxidize or what causes it to disappear?

Mr. WALKER. There are several possibilities. There may be a weathering of the material. There may be mechanical abrasion from one fruit rubbing against another due to the wind or the rubbing of a leaf over the fruit. Also your residues are calculated on a weight basis.

Now, during the time from 7 days to 28 days that cherry has increased in size, which may result in a lower residue when you consider it from a weight standpoint. But I believe that you have the three possibilities there, and I think all three of them probably contribute to it.

Mr. JONES. Thank you.

Dr. HEDRICK. Are there any other questions?

Dr. MILLER. I would like to ask a question.

Are you a toxicologist?

Mr. WALKER. No, sir, I am a chemist.

Dr. MILLER. You are not prepared to say then what effect the residue that is left there, after the treatment you suggested is carried out, might have upon the human being?

Mr. WALKER. No, sir; I am not prepared to answer that.

Dr. MILLER. Is there anyone here in your group that is prepared to answer it?

Mr. WALKER. Perhaps Dr. Sumerford.

Dr. MILLER. I think you made a fine analysis here as to the amount of residue and what happens in removing the residue, but I am interested in what happens to me when I eat the fruit, and you should be interested in it, too.

Mr. WALKER. I am, sir.

Dr. MILLER. And your testimony would be worthless without that conclusion, outside of knowing what would happen. It is a very fine analysis.

Mr. WALKER. Thank you, sir.

Dr. MILLER. But we must know what happens with the residue we do eat.

Dr. HEDRICK. Mr. Walker, why do you use 1½ percent hydrochloric acid in these washes?

Mr. WALKER. It was found by a matter of trial and error that 1½ percent is as high as we can go with reasonable safety. Fruit is subject to acid burning unless it receives a very copious rinse of fresh

water. Two percent practically assures you of burning and 1½ percent is the upper limit.

Dr. HEDRICK. Why do you use acid at all? What effect does acid have on the chemicals?

Mr. WALKER. There is perhaps a little chemical action on the lead arsenate. The chemical action would also be the loosening of the residue.

Dr. HEDRICK. Any questions?

Mr. HORAN. I might add we use sodium solution in one wash, soda, and then we use its opposite chemical.

Dr. HEDRICK. And the acid neutralizes the sodium?

Mr. HORAN. And the two of them give a cleansing effect.

You can see a washing machine in operation.

Dr. HEDRICK. I hope we do. I am interested in seeing that.

Mr. HORAN. And of course in between each wash there is a fresh-water rinse. You will see that. It is something we had to develop.

Mr. Chairman, I would like to say that the Spokane Chamber of Commerce is having a luncheon today and W. L. Clark, of the J. I. Case Co., who is a very good speaker, is the featured speaker, and everybody is invited to attend. I suggest that you take advantage of the invitation to hear a good speaker and you will get a good meal, and that is not very far from here.

Dr. HEDRICK. If there is no objection, we will be glad to attend.

Mr. Walker, we appreciate your statement before the committee and thank you very much.

The committee will now stand adjourned until 1:30.

(Whereupon, at 11:50 a. m., the committee recessed until 1:30 p. m.)

AFTERNOON SESSION

Dr. HEDRICK. The committee will come to order, please.

Who is the next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Webster.

(The oath was administered by the chairman.)

TESTIMONY OF ROBERT L. WEBSTER, PH. D., STATE COLLEGE OF WASHINGTON, PULLMAN, WASH.

Dr. WEBSTER. Mr. Chairman, I would rather not read all of this. I would just about as soon go over it and hit the high places.

Dr. HEDRICK. That will be all right. We will insert the whole thing in the record and you can summarize it.

Dr. WEBSTER. It includes my academic training.

(The statement submitted by Dr. Webster follows:)

STATEMENT OF ROBERT L. WEBSTER, PH. D., STATE COLLEGE OF WASHINGTON, PULLMAN, WASH.

My name is Robert L. Webster. From 1926 until my retirement in 1951, I held the position of entomologist in the Washington Agricultural Experiment Station. As such, I was in charge of the entomological investigations of that agency for the entire State. Since it was in 1926 that insecticide residues on apples and pears first became a matter of prime importance, I have had an intimate contact with this problem for 25 years.

My college training was in entomology, and I received the B. A. degree from the University of Illinois in 1908. After 11 years in experimental work in Iowa, I took graduate work at Cornell University and received the Ph. D. degree from

that institution in 1921. Between 1921 and 1926 I served as entomologist at the North Dakota Experiment Station and professor of entomology in the college. These years of experience in the eastern United States, the Mississippi Valley, and the Pacific Northwest have afforded unusual opportunities to become familiar with the problems of pest control, not only with fruit insects but also those of field crops.

My first experience with insecticides to control the codling moth was at Ames, Iowa, in 1909. At that time there was a controversy between entomologists, representing the far Western States and those of the eastern United States, concerning the use of insecticides and the proper times for their application. In the West it was claimed that the codling moth could be controlled by the use of a single arsenical spray, the so-called calyx spray, applied as soon as the blossoms dropped from the trees. In the eastern United States it was found necessary to make later applications in order to produce crops relatively free from worms.

Later on, it was found that experimental work in the West had been conducted in areas where the codling moth was no problem. Hence the excellent results obtained. In 1909 paris green was still the standard insecticide used in apple orchards. Lead arsenate was available in paste form, replaced a few years later by the dry powder as the commercial manufacture of this insecticide was improved.

By 1926 it was customary in the heart of the fruit district in Washington State to apply five or six cover sprays of lead arsenate during the season in addition to the calyx spray. Late applications led to excessive visible residues on fruits and the subsequent seizure of this fruit when it reached eastern markets. At first attempts were made to remove residue by means of wiping machines, but it was soon found that such machines only worked the residue into the wax on the surface of the apples and wiping was quickly abandoned in favor of washing fruit in a water bath to which was added dilute hydrochloric acid.

Following a conference in Washington, D. C., in April 1926, the Food and Drug Administration announced an unofficial tolerance on apples and pears of 0.025 grain per pound of fruit. This was a more liberal tolerance than that of Great Britain, originally established because of the presence of arsenic in beer and which amounted to 0.01 grain per pound. Early tolerances on arsenic, lead, fluorine, and DDT had no legal standing. At this time the pure food law of 1906 was in effect and this contained no provisions for establishment of a tolerance.

In order to allow fruit growers to use insecticides to control insect pests on the one hand, and to protect public health on the other, these tolerances were set up by the Food and Drug Association in Washington, D. C. Actually, they represented maximum quantities allowed before fruit was subject to seizure by that agency.

In the meantime worm control in the Pacific Northwest was becoming more difficult year by year. We know now that the codling moth was acquiring a degree of resistance and that the insect was actually more difficult to control in the irrigated regions of Western States than elsewhere in the country. Twenty-five years ago our State recommendations in Washington were 2 pounds of arsenate of lead per 100 gallons of water. We continued to make this recommendation even though most growers were actually using 3 pounds in the attempt to keep down residue on the fruit at harvesttime.

During these years, all over the country, investigations were under way in the attempt to find substitutes for lead arsenate and to avoid entirely the problem of dangerous residues on fruits. No insecticide was found that could be safely used without injury to fruits and accomplish codling-moth control equivalent to that of lead arsenate.

In January 1933 the fruit industry was notified that shipments showing excessive lead residue would be subject to seizure and condemnation. No tolerance was indicated, and statements from the Food and Drug officials were construed to mean that no lead residue on fruit would be allowed, however small the amount. There were years of confusion. Emphasis was placed on the maintenance of an adequate cover of lead arsenate on the fruit, especially during the forepart of the season, to produce a crop relatively free from worms. While eastern fruit growers considered worm control of 85 or 90 percent satisfactory, western growers considered it a failure. This was because of the high standards set by western growers to ship long distances to eastern markets fruit that was practically free from blemishes of any kind and especially free from evidence of insect attack.

More and more lead arsenate was used every year, and at one time Washington State was using 25 percent of the entire production of that insecticide in the United States. The peak came in 1943, when more than 17,000,000 pounds were sold in the State.

Mineral oil was added to lead arsenate in early cover sprays. This served to prolong the efficiency of the insecticide but also made it more difficult to remove at harvest. Another advantage in the use of the oil-lead-arsenate combination was that the oil served to kill eggs of the codling moth, especially when applied in the second and third cover sprays.

Meanwhile our experimental program included many trials of other nonlead arsenicals in the attempt to avoid the problem of lead residue at harvest. In 1933 recommendations came out from Washington, D. C., to use calcium arsenate in apple orchards late in the season. Entomologists in the Pacific Northwest did not go along with this recommendation because our own experience with calcium arsenate had not been very satisfactory.

I recall meeting a representative of the General Chemical Co. here in Spokane that year who told me that he was ready to order 10 carloads of calcium arsenate for use late in the season. After I had told him that we would not recommend it, the order was cut down to one carload. Later I was told that all of that was not sold.

It was in 1930 that the nicotine-oil combination was first recommended in Washington, in the effort to reduce spray residues on the fruit at harvest. It was soon realized, however, that nicotine-oil would not hold the worms in heavily infested orchards and the recommendation was soon modified to apply only to orchards with light infestations. With resistance of the codling moth increasing from year to year, it soon became evident that this combination would not hold the worms in the Pacific Northwest.

In 1938 many Washington fruit growers, desperate over their failure to control worms, turned to a nicotine-molasses combination, much advertised at the time by a small group of unscrupulous salesmen. Washington recommendations for that year stated that "the value of the nicotine sulfate-molasses combination has not been established and it may be dangerous.

One plot in the experimental orchard at Wenatchee was sprayed with that combination by James Marshall in 1938 with 80 percent wormy fruit at the end of the season. Some Washington growers, already heavily in debt, applied this nicotine-molasses combination in 1938 and lost their orchards as well as the crop itself.

Cryolite was first recommended in Washington in 1932, following the excellent results first obtained at the Federal Laboratory at Yakima, later at the tree-fruit station at Wenatchee. The use of cryolite in turn led to a tolerance on fluorine on the part of the Food and Drug Administration, later to be declared untenable by a Federal court in California. The maximum use of cryolite in the State was in 1944, when more than 5 million pounds were sold.

Early reports on codling moth control with DDT were discounted in the United States. These seemed too good to be true. Entomologists were inclined to believe that reports on a worm control on apple trees in Switzerland came from areas where there were very few worms in the first place.

Investigators in this country obtained DDT for experimental work several years before it was generally available for agricultural purposes. First applied throughout the entire season, following the old lead-arsenate schedules, it was soon learned that adequate control could be attained in the Pacific Northwest with less than half the number of applications. Not only this but the calyx spray, long considered essential 4 years out of 5, could be omitted entirely. Very little DDT is lost by weathering, both in the eastern United States and in the irrigated regions of the West. With increase in size of fruit during the late summer and since residue is measured in parts per million, the proportionate quantity at harvest is reduced to a minimum figure. At first we were concerned with DDT residues, since washing fruit sprayed with DDT failed to remove more than half of the residue. However, when it became evident that adequate worm control could be obtained and spray applications discontinued in midsummer, DDT residues at harvest were low enough to present no special hazard.

It was not until 1947 that DDT was recommended for codling moth control in the State of Washington. By this time, supplies were adequate and most growers turned to the use of the new insecticide that year.

In experimental work previous to 1947, it was found that the use of DDT aggravated the problem of orchard mite control. With the oil-lead arsenate

combination, orchard mites had been kept down by many growers, although not always in a satisfactory manner.

TEPP first came toto use for mite control in the Pacific Northwest in 1946, although at that time the commercial product had not yet been well standardized. No residue hazards on fruits or vegetables is involved in the use of TEPP although there is a health hazard in its use.

In 1947 parathion, another organic phosphate, was made available for experimental use and carefully investigated at the tree fruit experiment station at Wenatchee by W. J. O'Neill. Orchard mite control with parathion was highly effective and the new material was recommended by the Washington Experiment Station for 1948, combined with DDT for controlling the codling moth at the same time.

Seldom is an insecticide recommended on the basis of 1 year's experimental work. On the other hand, ample supplies had been made available, O'Neill's work was carefully done and a recommendation was in order. Residues of parathion at harvest, as determined by chemical analysis, were negligible. The hazard with parathion is to the spray operator, rather than the consumer.

Because of the many arbitrary rulings on the part of the Food and Drug Administration and the hardships encountered by fruit growers in their efforts to meet Federal tolerances, your committee will encounter much antagonism to that agency in your hearings on the west coast. Time and again these rulings have not been warranted by the facts.

In conclusion, it is my opinion that the Federal Food and Drug Administration has ample authority under present legislation to meet the problems involved in the hazards of human health following the use of insecticides. This authority is contained in the Pure Food Act of 1938 and in the Insecticide, Fungicide and Rodenticide Act of 1947. Amplification of this authority beyond its present scope, in my opinion, will result only in delay in the use of new materials or combinations and work undue hardships in the production of many crops where insecticides are necessary in order to produce foodstuffs free from insect contamination and fit for human consumption.

Dr. WEBSTER. It just happens that I came to the State of Washington at the time these spray residue troubles began to assume prime importance. There had been some seizures before that time, but the Food and Drug Administration became concerned about it. There were apples and pears coming from the Western States with visible spray residue and they were condemned. So something had to be done about it.

That goes back to the time, 20 or 25 years ago when they practiced rather intensive spray programs—6, 8, and even 10, cover sprays, and then they were not getting all the worms.

Now our growers here in the Northwest have to have a pretty high standard for the fruit because of the long distance that this fruit must be shipped in order to get markets. Ten percent worms in an apple crop would be considered a failure. Is that not right, Mr. Horan?

Mr. HORAN. That is correct.

Dr. WEBSTER. On the other hand, in New York State and some of the eastern apple-growing States they would think that was pretty good. But our growers have to have practically worm-free fruit in order to get any kind of a market, and even then sometimes we can't get a market.

My first experience in codling moth work—and the codling moth, of course, is a big problem of the apple industry, although mites are probably just as important, but they are so small we do not see them—I use the term "insidious" on occasion in connection with mite attacks. My first experience with the codling moth was back in Iowa, back in the time when we used paris green. At that time some of the western entomologists, Melander, in Washington, and Dr. Ball, in Utah, claimed they got rid of the codling moth by the use of a single spray.

That was paris green applied early in the season just after the blossoms dropped. And those men believed it, and some of the entomologists believed it. That is what got me into it. It did not work. It was not sufficient to control the insect.

Their experimental work so it happened, was done in an area where the codling moth was not much of a problem anyhow. That is one way to get good results—go somewhere where there isn't much of a problem.

Just a word about tolerances. I will read this on page 2:

> In order to allow fruit growers to use insecticides to control insect pests on the one hand, and to protect public health on the other, these tolerances were set up by the Food and Drug Administration in Washington, D. C. Actually they represented maximum quantities—that is, first, of arsenic, then of lead, later on chlorine, and still later DDT—represented maximum quantities allowed before fruit was subject to seizure by that agency.

I think Mr. Horan has already told you some of his own experiences along that line. Actually there was no legal standing of these tolerances. In 1926 the Food and Drug Administration was working under the original law which was, I think, put out in 1906. Dr. Wiley gets the credit for putting that one over, I believe. I happened to meet Dr. Wiley one time at the Cosmos Club in Washington, and he was a very fine gentleman.

But it was, as someone said this morning, an informal tolerance, and that would have worked all right if the Food and Drug Administration had had some real knowledge as to the problem that was involved in the growing of fruit, that is, the necessity for applying insecticides.

Of course, poisons are poisons. I will admit all that. In order to produce then a crop that is fit to eat, it sometimes seems like a question of either contamination on the one hand or a residue of an insecticide, a poison, because most of these chemicals are poisonous enough to kill insects, so are harmful to mankind. We have to admit that.

Dr. MILLER. Doctor, I notice in your statement, if you do not mind, you said that the arbitrary ruling on the part of the Food and Drug Administration caused some hardships to the fruit growers, and so forth.

Do you think they were a little arbitrary in trying to protect the public? Where is the middle ground? Where do we stop?

Of course, the idea, I think, was to protect the public.

Dr. WEBSTER. Undoubtedly, but it seems to me they overreached themselves, going too far. Of course, they did not want to take any chances.

Dr. MILLER. Of course that is hard to say, is it not, how far we should go to protect the public? I guess there is some middle ground, some halfway place where you could stop. But I wondered what your opinion was as to where that place might be, just what you thought.

Dr. WEBSTER. I suppose they will be arguing about that, Dr. Miller, long after you and I are gone.

Mr. HORAN. Will you yield to me there?

Dr. MILLER. Certainly.

Mr. HORAN. I would like very much to have Dr. Sumerford speak to this committee. Dr. Webster's place in life is not to determine those things.

Dr. MILLER. I see.

Mr. HORAN. He is hired to help us control pests which, in turn, make our produce unmarketable, and we will have to have from Dr. Sumerford, or someone else, the information as to how we can find out where the level should be.

Dr. MILLER. I think that is true. Of course, his statement on page 4 is that the committee would encounter much antagonism to that agency—referring to the Food and Drug Administration—in our hearings on the west coast; that time and again these rulings have not been warranted by the facts.

I suppose that is the reason. Of course, I can see how the growers would tend to resist any ruling on the part of Food and Drug Administration that might interfere with the growing or shipping of their produce. On the other hand, the Food and Drug people are charged by law with the duty of protecting the people, and if they did not do it, they would certainly come in for some difficulties as far as the Congress is concerned. So there must be some middle ground some place, and maybe the doctor you speak of can refer to it, which will be satisfactory.

Mr. HORAN. Yes.

Dr. MILLER. That is all.

Dr. WEBSTER. The entomologists have been between the devil and the deep blue sea on that score. There is a constant demand for, well, a nonpoisonous poison, that is, some chemical which will not be harmful to mankind, at least of little consequence, but kill insects on the other hand.

Dr. MILLER. Of course, as the committee knows, we run into the same problem, Doctor. I believe there are some 700 chemicals knocking at the door of the food industry asking for admission. Several hundred of them have not even been tested and yet the people making the chemicals want to put them in the things you and I eat, and some agency some place along the line is going to have to set up some standards and say, "You can," or "You cannot" use these chemicals.

Some of them, most of them, I think, have been all right and probably have been of great benefit, and I know you cannot raise apples out here without using some sprays and fertilizers or other things that go with it. But some agency, whether it is the Food and Drug Administration or some impartial agency, if there is such an animal existing, must set up some standards so the public must be protected.

Would you agree with that—that first and paramount is the protection of the public?

Dr. WEBSTER. I think we have that, Doctor, in the present pure food law and in the Insecticide, Fungicide, and Rodenticide Act of 1947. That is my opinion.

Dr. MILLER. I see.

Dr. WEBSTER. If they would actually enforce it I think it would be taken care of.

Dr. MILLER. But the thing of paramount importance is the protection of the public?

Dr. WEBSTER. Oh, yes, we can't deny that. During these days before DDT we were trying this, that, and the other thing to get away from both arsenic and lead, and there were hundreds and hundreds of experiments. I am speaking particularly of our activities especially at our Wenatchee Fruit Experiment Station. Most of them did not

work. They were talking about San Jose scale this morning, and I recalled an experiment with fish oil, I think it was fish oil and mineral oil where we sprayed some Winesap apples, and they were colored just as if, had the markings that look just like San Jose scale, but there was not any scale there.

Well, we tried the next year—we got control the first year and tried it the next year and it did not work out. It has been that way time and time again. Sometimes we think no one pays much attention to our recommendations. I believe Mr. Overley this morning submitted to the committee the recommendations from the Western Cooperative Spray Conference at Portland. I happened to be chairman of that committee for a good many years, so I know something about the pros and cons of their deliberations.

One thing that we can't agree on—Mr. Walker and I usually have an argument about that—they put the caption "suggestion." Well, I say they are recommendations, and they are taken as such. Because just as soon as you begin to specify types of application, times, materials, quantities, and that sort of thing, then somebody is responsible for that. That is a recommendation. That is a good deal more than just a suggestion. However, we are getting off the track.

At one time the State of Washington was using about 25 percent of the entire production of lead arsenate in the country. At one time they were allocating insecticides during the war, and I got a statement from somebody in Washington saying that they were going to give preference to the Eastern States in allocating lead arsenate; the Western States, well, they could take what they could get. Later on I found out that they were going to make special provision to bring in cryolite, which, as you all know, is a fluorine compound. We could use cryolite, and they had never been able to use it successfully back in the East.

And that brings up something else. Time and again we would try out materials. We tried out materials in the Northwest that were reported successful in the East and they didn't work. It took me a long time to figure out why. I think the reason is because of the shorter season. In an area where there is just one brood of the codling moth control is comparatively simple.

Now there is a large orchard in New York State. Chairman Delaney is not here. He probably would know where it is. I think it is said to be the largest McIntosh orchard in the country—it is a place called Chazy which is up pretty close to the Canadian border. McIntosh apples are supposed to be very susceptible to the codling moth, but yet they are so far north and have such a short season they can get by with very little trouble. So this matter of the length of season and the number of broods of the codling moth has a great deal to do with the success or failure.

Of course, the insect has been building up resistance. When we first heard about this 40 years ago, entomologists were inclined to scut it and did not believe it, but it has been well established. It was first established in some work done right here in the State of Washington with respect to the San Jose scale. Then later on a man back in Virginia showed that worms from apple orchards in Grand Valley in Colorado, and from Yakima Valley in Washington, were harder to kill with lead arsenate than were native-born Virginia worms, so to

speak. That resistance has been pretty well established with several insects.

As far as DDT is concerned we haven't found any evidence of resistance in codling moth. Now that may sometime develop, and that worries me sometimes—the fact that these different insect pests will build up that resistance to the most potent insecticides. It makes me concerned when you talk about having legislation which is so hard and fast that it is changed only with a great deal of difficulty. Are there any questions on this? There may be one or two points I would like to read.

Dr. MILLER. Mr. Chairman, I would like to ask the doctor—you spoke about the western cooperative spray project conference?

Dr. WEBSTER. Yes.

Dr. MILLER. I suppose over a good many years and many experiments you have come to certain conclusions, recommendations, or suggestions, I believe you call them, for the control of orchard insects, mites, and plant diseases in 1951. You make some suggestions. They are good suggestions. Why do you not put them in as a regulation, police your own industry and say "This is what we have found has been good and this is what you must do if you sell apples", instead of just making a suggestion and letting them go ahead and doing as they please? In other words, I am a man of direct action. If I think something is good, I go do it. If these are good, why don't you tell the orchard growers "You must do this"? What would be wrong with that?

Dr. WEBSTER. I don't think they would do it.

Dr. MILLER. In other words, they are not doing it now?

Dr. WEBSTER. There is no use of telling people——

Mr. HORAN. We have a State law which indirectly compels a man to care for his orchard.

Dr. WEBSTER. I think Dr. Miller is going farther than that.

Dr. MILLER. I am talking about the suggestions you find, apparently from experience, are good things to follow, and yet you say they do not follow them. Why not just make them part of the regulations?

Dr. WEBSTER. They don't follow them. I think there is a good deal of irregularity about it. I think, in general, they are looked to as a dependable source of information.

Dr. MILLER. I see.

Dr. WEBSTER. But it is pretty hard to tell a farmer——

Dr. MILLER. What he should do. If they do it, they probably will get good results; yet, if they do not do it, there is nothing particularly you can do about it. I suppose that is right.

Dr. WEBSTER. I remember in Wenatchee a number of years ago when RACC was operating it did exercise some control over the use of materials. They would not lend money.

Mr. HORAN. They divided the borrowers into about four categories. On this one category they practically supervised completely and told him what to use in spraying and everything else. But some of their borrowers, where their accounts were good, they exercised no restraints at all.

Dr. WEBSTER. Didn't they refuse to lend money to the growers to purchase an insecticide that wasn't much good—like nicotine molasses, for instance?

Dr. MILLER. Do you have salesmen now that come around and give you a pretty good sales talk when they have a new chemical developed which you might get the growers to buy?

Dr. WEBSTER. Yes. We take that with a grain of salt, always.

Dr. MILLER. Some buy it, and some do not, I suppose?

Dr. WEBSTER. The large concerns are pretty good, though. They try things out pretty well. Now before parathion was brought out the American Cyanamid Chemical Co. went into that pretty thoroughly. Not only that, but they sent all their experimental results right on to the Food and Drug Administration in Washington so they knew what was going on.

Dr. MILLER. Do you know of anyone using parathion?

Dr. WEBSTER. There is, I think, about 6,000 pounds of it sold in Washington—was last year, I mean, 1950.

Dr. MILLER. Is it recognized by your group as a method to control mites, insects, and so forth?

Dr. WEBSTER. The best thing we have ever found to control mites.

Dr. MILLER. Have you any question as to its toxicity and the residue left on the fruit?

Dr. WEBSTER. We have no difficulty in meeting the proposed tolerance, two parts per million, when no spraying is done after midsummer. Now with late applications, 30 days—probably you could shave that to 15 days—that might give you some residue.

Dr. MILLER. There are some variables in there, of course.

Dr. WEBSTER. You see parathion breaks down pretty rapidly of its own.

Dr. MILLER. Yes, the toxicity of parathion might be different for different individuals, too. Some people might take quite a little of it and not be seriously affected and others might take a very small dose and it might make them ill.

Dr. WEBSTER. The Public Health Service at Wenatchee is doing some very good work along that score, and their findings as I understand it, indicate that when proper precautions are used they have very little trouble. Dr. Telford knows about that. Dr. Telford, can you add to what I said about that?

Dr. HORACE S. TELFORD (chairman, department of entomology, State College of Washington, Pullman, Wash.). I think that is essentially correct, Dr. Webster. We do not feel that we have appreciable amounts of residue remaining on food or foliage just sprayed with parathion according to our own recommendations, and that is essentially not more than 1 pound of 25 percent wettable powder be applied to foliage.

Dr. MILLER. Let me ask you a question there. Do you think the injudicious use of parathion would be dangerous?

Dr. TELFORD. Yes, definitely so.

Dr. MILLER. Would you define the injudicious use of parathion?

Dr. TELFORD. I would say the injudicious use of parathion would be to use it not in accordance with our own recommendations. For instance, we give them considerable information concerning precautions they should take. For example, we suggest—in fact, we strongly recommend—that an approved respirator be used, and especially when they are filling the tank with the wettable powder.

We do know that occasionally the grower will not abide by that regulation or recommendation which we give. That is an instance

where I would say that they had not used the judgment they should, and under those conditions we might reasonably expect with continued exposure they would get into trouble.

Dr. MILLER. That would be an injudicious use of it. Of course, the United States Public Health Service—for instance, their code for grade A milk doesn't permit any DDT at all. I am wondering whether such a code should be set up or not for apple growers and vegetable growers, everybody.

People raising vegetables are using a lot of DDT and so forth. Maybe the same standards should prevail for vegetables and fruits as prevail for milk. If you are going to have grade A milk, you can't have any trace of DDT in it. Would that fit into your thinking as far as the fruit and vegetables industry is concerned?

Dr. TELFORD. Possibly so. However, we are making recommendations to the best of our knowledge in regard to the amount of residue that will be left on our foliage and on our vegetables and fruits at the time of consumption, and when the tolerances are finally established by the Food and Drug that will be a guide for our growers in the use of those materials.

Dr. MILLER. Well, do you know whether the Food and Drug people have advocated, or say that you can have a certain percentage of DDT or parathion included?

Dr. TELFORD. That is what we will wait and see.

Dr. MILLER. Haven't they made a ruling on that?

Dr. TELFORD. We have an informal tolerance of 7 parts per million, as I recall it, in regard to apples and pears. As soon as those hearings come out so they will be a guide to use, I don't think we will run into difficulty on that score.

Dr. MILLER. I see. All right.

Dr. HEDRICK. Go right ahead, Doctor.

Dr. WEBSTER. We began work on the organic phosphates because of the difficulty in controlling mites with DDT. They seem to thrive on it. Of these parathion has been about the best. Another one that you have heard of, of course, which is tetraethyl pyrophosphate. It is good but it has no residual properties. In 24 hours' time it is all broken down. Now that is fine from a residue standpoint but not so good from the standpoint of protecting the crop from attacks by mites. I think Washington probably was about the first State to recommend parathion. Mr. O'Neill, an entomologist at Wenatchee, and I argued about it. I was concerned about residue problems because of the difficulties before with arsenic residue, with lead residue, and later with fluorine. But there didn't seem to be any residue problem involved at all with parathion. What I didn't realize was the hazards of the operator. As you know, there are a number of deaths that have occurred, some of them in the manufacture of the material and several in the actual application of it.

Dr. HEDRICK. How many deaths do you have a record of, Dr. Webster?

Dr. WEBSTER. I have a record of six in this circular. I think there have been some since that was put out.

Didn't you tell me, Dr. Telford, that a youngster at Yakima was killed by parathion this summer?

Dr. TELFORD. I heard that. I think Dr. Sumerford is the man who investigated that, and I think discussion on that should be relegated to him. It is true I did hear of that.

Dr. WEBSTER. I think that we have been powerfully lucky because we have used large quantities of it. Seldom is an insecticide recommended on the basis of 1 year's experimental work. Some years back we could take our time with it and work with materials for 3 or 4 years until we were ready to make a recommendation, but there is so much pressure, so many new materials coming on all the time, we just feel driven all the time.

I will read the two paragraphs even if I do get into trouble. Because of the many arbitrary rulings on the part of the Food and Drug Administration and the hardships encountered by fruit growers in their efforts to meet Federal tolerances, your committee will encounter much antagonism to that agency in your hearings on the west coast.

Time and again these hazards have not been supported by the Public Health Service. That is the work that was done in case of arsenic and lead residues at Wenatchee a number of years ago, and that gives the tolerances—on arsenic, also on lead, and they go up and down—1927, 0.025, for arsenic; 1928, 0.02; 1929, 0.17; 1930, 0.15; 1931, 0.12; 1932, 0.1. That was what the fruit grower was up against. Mr. Horan was blaming Mr. Tugwell for some of those things this morning, I believe. I remember one story. Perhaps this should be off the record. Use your own judgment about that.

Dr. HEDRICK. Go ahead.

Dr. WEBSTER. Mr. Tugwell came out here and told some of our fruit growers that they were using antiquated washing equipment, out of date 10 years before. Well, 10 years before they did not have any washing equipment, and I believe he taught for a year at the University of Washington at that, and he should have known better. I think perhaps that should be off the record but use your own judgment about it.

Dr. HEDRICK. I see no objection. It can be on the record.

Dr. WEBSTER. In conclusion, it is my opinion that the Federal Food and Drug Administration has ample authority under present legislation to meet the problems involved in the hazards of human health following the use of insecticides. They are working now under the act of 1938, and it took them 10 years to call for hearings on insecticides such as, well, the commonly used insecticides.

They had a hearing in Washington starting in about 2 years ago. They should have made up their minds by this time but, of course, it is a very difficult problem and there are a lot of angles to it. As I say, I think they have authority to handle them—the problems that are coming up at least in the near future. Now, 5 or 10 years from now we may have an entirely different circumstance to meet. Insects are going to get harder to control rather than easier. Amplification of this authority beyond its present scope, in my opinion, will result only in delay in the use of new materials or combinations and work undue hardships in the production of many crops where insecticides are necessary in order to produce foodstuffs free from insect contamination and fit for human consumption.

That concludes my presentation.

Dr. MILLER. Doctor, Mr. Chairman, at that point, I don't want to monopolize this, but I would like to ask just this. Why do you think the present law is ample——

Mr. WEBSTER. Right now, I do; yes.

Dr. MILLER. You do say so?

Dr. WEBSTER. Yes.

Dr. MILLER. You do say that amplification of this authority beyond its present scope, in your opinion, will result—and this interests me—in delay in the use of new materials or combinations. Do you think new materials or combinations should be used without ample check-up by some agency, or do you propose to put them into the food stream of the country without knowing what they are going to do?

Dr. WEBSTER. I am afraid if we are to wait for Food and Drug, it will take 10 years.

Dr. MILLER. I agree they are too slow, and bureaucrats quarrel among themselves. We've got that happening down there all the time and don't get any place. But I would hesitate very much to say to industry, "You go ahead and use whatever you think is right and we will check up after a while and see whether it is all right or not."

I think industry generally is doing a good job, but also in the competitive field there are some on the ragged edge who want to cut corners and do things that do not always fit into the good ethics of business. You know that. That is common practice. Do you think that we should turn these fellows on the fringe loose and say, "Go ahead and sell all these chemicals you can regardless of their effect upon the food stream"?

Dr. WEBSTER. I do not think they are doing that.

Dr. MILLER. I know, but do you think we should permit any of them to do that? Down in Florida we had some people using some spray on oranges, and when you fed the orange juice to the rats, it killed the rats and made babies sick. It was sold by a fellow on the fringe that wanted to cut corners. You are going to have to have some policing agency some place along the line.

Dr. WEBSTER. Don't you find that same thing in medicine, Dr. Miller?

Dr. MILLER. Yes, and they have to be policed.

Dr. WEBSTER. You get a great discovery, and presently the thing isn't much good, or it has adverse effects which preclude its use.

Dr. MILLER. But we have an agency, of course, in the American Medical Association, that eventually makes a determination before a thing is used. Before they give the official ruling it has to pass pretty rigid tests. I don't believe I would open the gate and say to these people, "Sure, go ahead and sell anything the ordinary man might want to buy and let the buyer beware, or the consumer beware."

Now, I do not want the consumer to beware. I want some agency to say, and I thought you were going to suggest that we set up an independent agency of some kind that could act quickly on these things and maybe police it yourself to make sure we do not throw a constant stream of poisonous chemicals into the food stream of the human race.

Dr. WEBSTER. I think that is being done. Perhaps not as far as it should be done. But you come back to the same old story that poisons are poisons.

Dr. MILLER. That is right.

Dr. WEBSTER. Yes.

Dr. MILLER. I guess that is all, Mr. Chairman.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. No.

Dr. HEDRICK. Mr. Horan?

Mr. HORAN. No questions.

Dr. HEDRICK. Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Webster, are you the author or compiler of this booklet entitled "New Insecticides: Their Use, Limitations and Hazard to Human Health," put out by the Washington Agricultural Experiment Stations, Institute of Agricultural Sciences, The State College of Washington?

Dr. WEBSTER. That is right.

Mr. KLEINFELD. Do you have the latest edition with you?

Dr. WEBSTER. This is a 1950–51 edition. Is that what you have?

Mr. KLEINFELD. I have here one marked "1950, Station Circular No. 64, Third Revision." Is that the one immediately preceding the 1951 current revision?

Dr. WEBSTER. Yes.

Mr. KLEINFELD. I just want to ask you a few questions about some of the things here. On page 5 of this 1950 edition of Station Circular No. 64 you say:

> Because of so many reports of dead game birds found in orchards, the Washington State Department of Game assigned Mr. Mohr, one of their game biologists, to look for dead game birds in orchards and to find out the spray schedules in those orchards where these were observed. During these 2 years, some 750 cases of dead game birds and song birds were studied. At the present time the evidence points to chronic DDT poisoning, rather than to other new insecticides employed in Washington orchards.

Now apparently a large number of birds were killed in your opinion by chronic DDT poisoning, is that correct?

Dr. WEBSTER. First, we thought it was due to tetraethyl, which was being used quite extensively at that time. The facts accumulated by Mr. Mohr did not bear that out. Since they were using DDT in large quantities at that time, it looked like a case of chronic poisoning.

Mr. KLEINFELD. Has your opinion changed since then?

Dr. WEBSTER. It has not.

Mr. KLEINFELD. I mean, do you believe that this was due to chronic DDT poisoning or some other cause?

Dr. WEBSTER. I think it is DDT.

Mr. KLEINFELD. On page 6 of your booklet you point out that "orchard mites" have become more of a problem on tree fruits where DDT has been used. Has that been a serious problem since the increasing use of DDT in the orchards?

Dr. WEBSTER. Yes, much more than it was previously. Now, previous to DDT they were using one of the petroleum oils along with arsenate that made the lead arsenate stick better to the apples and foliage but also made it harder to remove at the end of the season.

This oil has what we call ovicidal properties, kills the eggs of the mites and also those of the codling moth if you get it on at the right time. But they no longer use oil. They did use some oil with DDT and I guess it did not kill the trees, but it didn't do the trees any good, it injured them.

Mr. KLEINFELD. Has the use of DDT had an adverse effect on various orchard soils?

Dr. WEBSTER. This orchard soil already has a tremendous quantity of lead arsenate in it, four or five tons or more.

Mr. KLEINFELD. That must be what you mean on page 9. Here is what you say about that, Doctor:

> If DDT does not break down in orchard soils, continued application over a period of years will aggravate a condition already serious because of the quantity of arsenic now present in these soils. That it persists in the soil is indicated by the work of M. C. Lane, Bureau of Entymology and Plant Quarantine, who found that DDT will kill wireworms in soil even after 5 years, following applications at the rate of 10 pounds (actual) per acre. While 10 pounds per acre does not appear injurious to plant life, the application of that much over a period of years may be quite a different story.

Now that presents a fairly serious problem, does it not, sir?

Dr. WEBSTER. It does.

Mr. KLEINFELD. What is being done about it?

Dr. WEBSTER. Perhaps Mr. Walker can answer that question better than I can. There is some indication that the accumulation gets up to a certain point and levels out. That may be due to bacterial action. Mr. Walker, can you bring that out in a few words?

Mr. WALKER. While I was connected with the State college I took part in the program studies of various points, and we had an indication that after a concentration builds up to a certain level it tends to level off, which may be due to microbiological activity in the soil. But that program is new; it has been under way only about 3 years. I don't feel we are in any position to give a definite position one way or the other on it.

Mr. KLEINFELD. That is apparently another one of the things concerning the effect of DDT about which we do not know much, isn't that correct?

Mr. WALKER. Yes.

Mr. KLEINFELD. Dr. Webster, on page 9 of your statement you say that:

> No residue problem is involved when dry peas or peas grown for processing are sprayed or dusted with DDT. However, there is a hazard to human health when pea forage is fed to dairy cattle because of the danger of the accumulation of the insecticide in the milk. The same thing is true of alfalfa treated with the insecticide to control Lygus bugs or other insects.

Now that danger to human health when pea forage is fed to dairy cattle is caused, is it not, by accumulation of DDT in the cow and subsequent release in the milk?

Dr. WEBSTER. Butterfat.

Mr. KLEINFELD. In the butterfat.

Dr. WEBSTER. Yes.

Mr. KLEINFELD. Who sells this pea forage for use as forage for dairy cattle?

Dr. WEBSTER. We advise against that, but there again we can't control all the operations of the farmer and the fruit grower. Now, in western Washington around Mount Vernon where they raise a lot of peas for processing, they stuck to rotenone which was the standard recommendation for pea weevil control on account of the hazard of accumulation of DDT in the milk. But we have the feeling that elsewhere in the State they are going ahead and using pea forage which has been dusted with DDT, feeding it to dairy cattle.

Mr. KLEINFELD. Where do they get the pea forage?

Dr. WEBSTER. The fields of peas after they have been vined and sent off, in the case of peas for processing, sent off to a freezing concern or to the canner.

Mr. KLEINFELD. Does the same deleterious consequence result from the dusting of alfalfa with DDT?

Dr. WEBSTER. There is that accumulation in butter fat. I do not know why Food and Drug doesn't do something about it. I understand that some samples of butter have shown as high as 60 parts per million in terms of DDT.

Mr. KLEINFELD. That is a terrifically high amount, is it not?

Dr. WEBSTER. Very high, way over any reasonable tolerance.

(Discussion was continued off the record.)

Mr. KLEINFELD. Dr. Webster, suppose DDT had not been discovered or concocted by some Swiss chemist years ago, and some chemical manufacturer came out with DDT now. Do you think that before we allowed him to sell it for wide use as an insecticide, including its use on dairy cattle and in dairy barns and for dusting alfalfa, we should find out about the residues and its tendency to get into cows and be released in milk.

Dr. WEBSTER. There would be a lot of crops lost in the meantime.

Mr. KLEINFELD. There would also be a lot of DDT stored up in people, would there not, because we know that milk is drunk by children and babies, as well as adults, and we have to be pretty careful. Nobody disputes the fact that you have to use these things, of course, and very often you have to use new insecticides. But is it an unreasonable thing to ask of a man who is coming up with a new chemical, "Have you made sufficient tests to determine the freedom of the substance from toxic effects"—to require him to disclose to some scientific body or governmental agency what was done in the way of toxicological and pharmacological studies; that it will or will not be absorbed by certain animals in various ways; that these are the residues, and so on.

Would that be asking too much of the manufacturer of DDT if he came out with it now, in your opinion?

Dr. WEBSTER. Well, we haven't learned all about DDT even yet.

Mr. KLEINFELD. And thus if a manufacturer came out with benzene hexachloride now, would it be expecting too much to require that he "Tell us whether you have conducted experiments which show whether or not off-flavors will result in crops on which benzene hexachloride is used"—on peanuts, for example?

Dr. WEBSTER. That is something I think takes care of itself if they use it once, they don't go back to it again.

Mr. KLEINFELD. Weren't there quite a number of crops lost because of off-flavor caused by benzene hexachloride?

Dr. WEBSTER. I heard this story several years ago of potato crops in Yakima Valley where they used benzene hexachloride and they could not sell it. Finally they got rid of it by selling to St. Louis. I understand that the Negroes in the Negro section down there didn't mind the taste but they could not sell it in Washington.

Dr. KLEINFELD. You, say for example, Dr. Webster, on page 38:

From elsewhere in the country have come reports of off-flavor on canned peaches following the use of benzene hexachloride. In fact, the National Canners Association, in 1948, advised their members not to accept any fruits for processing on which applications of this insecticide had been made at any time during the growing season.

You also say in this circular that:

> The use of BHC on vegetables in western Washington, even the refined high-gamma product where the musty odor is slight, has resulted in off-flavor in certain vegetables. While this may be difficult to detect in fresh vegetables, the canned product may have a very definite off-flavor.

There have been numerous reports of such off-flavors in canned vegetables; is that not true?

Dr. WEBSTER. Yes.

Mr. KLEINFELD. And might not that be another thing useful to know, from the farmer's viewpoint, before a new insecticide is used?

Dr. WEBSTER. About the only place we use benzene hexachloride in Washington is, first, on livestock, and second in the Skagit Valley in that area there where they raise a tremendous lot of cabbage seed. I have been a little concerned because they grow potatoes on some of that same ground, that later crops might be affected, but the quantity used is so small per acre, and as far as I know no cases of off-flavor to potatoes have been found.

Mr. KLEINFELD. There have been some reports to this committee, Dr. Webster, that benzene hexachloride has been used on cotton, and there was an off-flavor even on the subsequent crop, for example, peanuts. Have you heard reports of that nature?

Dr. WEBSTER. I think I have; yes. I am not surprised. I say that is a matter that pretty quickly takes care of itself. The worst of it is, it is such a good insecticide. It is really much better than DDT.

Mr. KLEINFELD. It remains in the soil quite some time, does it not, Dr. Webster?

Dr. WEBSTER. Benzene hexachloride breaks down more quickly than DDT. It takes 4 or 5 years probably to break down completely. We do not know too much about it, but the evidence so far shows benzene hexachloride does break down more quickly, at least the insecticidal value goes way down.

Mr. KLEINFELD. It may remain in the soil for several years, may it not, Doctor?

Dr. WEBSTER. Yes, that is right.

Dr. HEDRICK. Mr. Kleinfeld, do you have any further questions to ask?

Mr. KLEINFELD. That is enough.

Dr. HEDRICK. Thank you, Doctor.

Dr. WEBSTER. Thank you.

Dr. HEDRICK. Who is the next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. B. Rodney Bertramson.

(The oath was administered by the chairman.)

Dr. HEDRICK. You may proceed.

TESTIMONY OF B. RODNEY BERTRAMSON, PH. D., CHAIRMAN, DEPARTMENT OF AGRONOMY, STATE COLLEGE OF WASHINGTON, PULLMAN, WASH.

Dr. BERTRAMSON. I have two statements here that have been prepared after conferring with our agronomy staff, one on fertilizers and one on herbicides. If it is agreeable to the committee I will read them both.

Mr. KLEINFELD. Very well.

Dr. BERTRAMSON. My name is B. Rodney Bertramson, chairman, Department of Agronomy, State College of Washington. I received bachelor of science and master of science in agronomy at the University of Nebraska and doctor of philosophy in soils with supporting courses in chemistry and plant physiology at Oregon State College. I have worked as soil scientist for USDA, for Colorado State College, University of Wisconsin, Purdue University, and Washington State College. I am presently chairman of the department of agronomy, including crops and soils, at Washington State College. I have conducted or supervised research bearing on the subject of fertilization and its effect upon crops as follows: Organic phosphorus in the nutrition of plants. Manganese, sulfur, boron, potassium, and phosphorus fertility studies. During the war, I served as food and agricultural specialist in charge of regional food and agriculture for the Rhineland and later Gross Hessen in the military government of Germany.

STATEMENT ON THE USE OF FERTILIZERS

Phenomenal yield increases of high quality crops have made this country a land of abundance even with great increases in population. The extent of land suited to crop production is limited. Increased food production is largely possible through increased yields. Volumes of research data from State experiment stations, Federal research agencies, and from private industry of this country prove beyond a doubt that these yield increases are only possible through returning to the soil and replenishing in the soil those plant nutrients exhausted through cropping.

The addition of fertilizer to the soil is merely a replenishment of the plant nutrients exhausted by cropping or present initially in inadequate quantities. These are the same elements returned to the soil through manure and crop residues. They are largely in the same form as those in the residue and manure following their decomposition in the soil.

The use of fertilizers is not new. Over 100 years of results with present forms of fertilizers have been obtained at the Rothamsted Experiment Station in Great Britain. Use of land plaster or gypsum dates back at least to times of the Roman Empire. There are no data available to show any harmful effects upon human nutrition through fertilization of crops with commercial fertilizers. While nitrate poisoning of livestock has been mentioned and evaluated by Dr. L. A. Maynard, page 729 of H. R. 323 of Eighty-first Congress, he mentions that no experiment to date has shown a relationship between high nitrate content in foods and nitrate poisoning in man. Selenium is the only mineral element known to be absorbed from soil by food and feed plants in sufficient quantities to render it lethal to animals (Soil Science, 60: 125). As mentioned by Professor Truog, page 465 of H. R. 323, adulteration of fertilizers with selenium could result in harmful effects upon human nutrition. I know of no case in which selenium has been contained in commercial fertilizers. The only other source would be through its use as an insecticide. It should not be used as such on soils committed to feed or food crops consumed by animals or humans.

Certainly not unless there are some studies made to find out whether it is contained in the plant parts that are fed to the animals, or consumed as food.

I fully endorse the recorded testimony presented this committee by some of the leading soil scientists and agricultural chemists in the United States of America, namely: Dr. William A. Albrecht, page 202 of H. R. 323 of Eighty-first Congress, second session; Dr. Firman E. Bear, page 535 of H. R. 323 of Eighty-first Congress, second session; Dr. Rodney C. Berry, page 560 of H. R. 323 of Eighty-first Congress, second session: Dr. Richard Bradfield, page 521 of H.R. 323 of Eighty-first Congress, second session; Dr. Russell Coleman, page 551 of H. R. 323 of Eighty-first Congress, second session; Dr. Ralph W. Cummings, page 541 of H. R. 323 of Eighty-first Congress, second session; Dr. Leonard A. Maynard, page 723 of H. R. 323 of Eighty-first Congress, second session; Dr. Emil Truog, page 463 of H. R. 323 of Eighty-first Congress, second session. Dr. F. W. Parker, page 479 of H. R. 74 of Eighty-second Congress, first session.

I have listed those men, because I have studied their testimony. I know most of them personally and hold them in high esteem as capable soil scientists. The testimony of these men fully confirms the importance of fertilizer and refutes with data from well-planned experiments the claim of organic farming enthusiasts based upon broad observations and unreplicated experiments of men not trained in scientific methods of research. Similiar testimony to that of the scientists named above could be supplied by State experiment station and USDA scientists all over the United States. I was pleased in reading through the testimony to see the questions of your member, Mr. Abernethy, on the testimony of Mr. Rodale because we who are in experiment stations have little patience with claims that have no experimental evidence back of them.

STATEMENT ON THE USE OF HERBICIDES

Fighting weeds is an endeavor as old as crop production. The methods of soil preparation and crop management have always been conducive to weed growth. Furthermore, weeds can persist in cultivated lands because of special reproductive means such as seeds. These, as well as vegetative parts, such as creeping roots, rhizomes, and bulbs, may remain viable in soil for many years. Consequently, weeds often take over and completely dominate large areas of otherwise valuable cropland unless controlled.

Tillage and hand methods of control are frequently inadequate, expensive, and conducive to soil erosion. Crop rotations are a help. However, after years of cropping and inadequate weed control, the need for chemical herbicides has become urgent.

The most desirable chemical herbicides are toxic to weed plants but do not injure certain crop plants. Compounds of the 2,4-D type can be used to kill weeds in cereals and grasses and will not harm or modify these crops. Other chemicals such as selective dinitro compounds, kill weeds in grasses, peas, alfalfa, clovers, flax, and onions without damage to these crops. Chemical herbicides applied to crops to kill the associated weeds frequently increase the yield of a crop from 5 to 50 percent. In many cases a crop that would otherwise have to be abandoned may be saved through proper weed control.

If weeds are not effectively controlled, they reduce crop yields by competing for moisture, nutrients, space, and light. Weeds may reduce the quality of livestock products. Weeds are frequently hosts to insects and disease organisms. They increase labor and machinery costs.

Chemicals presently used for weed control decompose rapidly in the soil and therefore will not accumulate after years of repeated application and will not become harmful to desirable crops or animals. Nor is there any health hazard resulting from the consumption of produce treated with herbicides at dosages recommended for weed control. It is true some chemicals applied to the soil for weed control cause it to be unproductive for a few months or a few years, but the effect is relatively short-lasting and there are no harmful residues from the decomposition of the chemical herbicide.

Thank you.

Mr. JONES. Do you have any questions, Dr. Miller?

Dr. MILLER. First, I am very glad to have Dr. Rodney Bertramson here. I knew him back in western Nebraska when he was a young man there with his folks, and they were very proud and are very proud that he has traveled along the road he has, first the University of Nebraska, then out here to Washington and Oregon in the West, where I know he has contributed a great deal and will contribute to the field of his interest.

Doctor, I have been reading, as I told you this morning, Dr. William A. Albrecht's experiments with fertilizers and so forth. Dr. Albrecht is from Missouri.

Dr. BERTRAMSON. Yes.

Dr. MILLER. I gathered from your remarks that perhaps by the judicious use of fertilizer you might produce more crops, but that it probably would not affect the quality of the crop. It might affect the quantity but not the quality. Would you agree with that, or would you go along with Dr. Albrecht, who seems to feel a considerable change in the quality as well as the quantity of the crop comes about from the use of fertilizers?

Dr. BERTRAMSON. It is a very complex question to answer. In his article, Soils and Health, that Dr. Maynard has prepared is one answer to your question. That still does not give an absolute clear-cut answer.

There are cases where we know we can improve the mineral content. For instance, in the State of Washington through continued use of phosphate fertilizer, we can increase the phosphate content of our alfalfa about 50 percent and increase the yield 75 percent. But perhaps even the low level still is adequate as far as mineral nutrition is concerned.

Dr. MILLER. I heard Dr. Albrecht testify, and I do not think I agreed with him in all that he said. He was a very forceful man but I notice in reading part of his testimony he says:

> The fact is our health has been endangered because in growing all foods we have not fertilized the soil to provide a balanced ration for the plan in terms of the fertility elements coming from the soil. Plants so grown cannot create the food essentials commonly expected of them.

Then he goes on and says how it it affects the health of the human being. They carried out some experiments in their meadows and he states, and I quote:

> We have been using the choice of the animal as an indicator regarding the value in the feed, and we have an interesting demonstration in which we fertilized 4 acres of a meadow, and those 4 acres went with 21 other acres into a haystack and there were three other haystacks of 25 acres in each field, and the cattle chose that one haystack with 4 acres of the fertilizer in it for 8 successive years after there was no more fertilizer applied, and in the eighth year they cut the haystack in two because the farmer had the 4 acres in the part of the haystack that they ate first, and he built an end on the haystack to put the 25 acres in it. So that the cow tells us that she can recognize 600 pounds of fertilizer the eighth year after its application, and when it is only 4 acres in 25 in the total haystack.

I am wondering—in that experiment the old cow was a laboratory animal and because the ground had been fertilized apparently the cow recognized the part of the haystack that had the hay that was fertilized. Have you carried out any experiments out here along that line, and, if so, what would be your experience?

Dr. BERTRAMSON. It is quite a complex thing, this matter of palatability. There is what you are speaking of—whether it tastes good or not to the cow?

Dr. MILLER. Yes.

Dr. BERTRAMSON. We have not made any detailed experiments on that here. You have to include the cow psychology, too, I suppose, along with many of these other factors.

That is, you need a replicated plot set up. Well, why will a cow go to one area rather than another? You would have to run controls first to find out if it were all treated alike to what part she would go, and things like that. It is rather complex. I notice one comment of Dr. Albrecht's about the palatability of various grasses for cows, he said they would not eat these areas where droppings had fallen.

A recent news item in Crops and Soils, one of our agronomy publications, pointed out that if you would spray these areas contaminated by the droppings from the cow, with a little sugar solution, which has nothing to do with the mineral, merely the sugar, the cows would eat them with great avidity. They like it then. So there are so many complicating factors.

Dr. MILLER. Of course, I can remember on the farm that the area on which the cow out in the pasture urinates, develops a nice green spot there the next year, but the cow didn't eat from that area for 2 or 3 years, something happens to that grass. Maybe some of the nitrogen goes out.

Dr. BERTRAMSON. It may be there is a low sugar ratio there.

Dr. MILLER. Are you doing any work on the attempt to change the quality of, for instance, apples? Would there be a possibility of changing, not the quantity, but the quality of an apple as to its carbohydrates and other minerals that the apple might have through the judicious use of fertilizers?

Mr. BERTRAMSON. There is some interest on the question now of whether or not the application of potash where it might be low might improve the keeping quality. It is a good question. I do not know the answer. It is being thought of and perhaps investigated in a general sort of way.

Dr. MILLER. I think that is all.

Mr. HORAN. It is true, of course, that fertilizer will affect the coloring of apples, is it not?

Dr. BERTRAMSON. Yes, I think that is true. You can get a wide range of effects on crops, different results, by applying different fertilizers, depending on the level you have of the particular elements that are available in the soil.

Mr. HORAN. That is all.

Mr. JONES. I have no questions.

Mr. KLEINFELD. Dr. Bertramson, do you know of any authentic instances of any harm to either animals or humans caused by nitrate poisoning?

Dr. BERTRAMSON. No, I do not. I read this material of Maynard's and that is the extent of my knowledge on that subject.

Mr. KLEINFELD. There is nothing else in the literature as far as you know?

Dr. BERTRAMSON. No, I have never seen anything in the literature other than that.

Mr. KLEINFELD. Are you in a position, Dr. Bertramson, to tell the committee something about the drift problem where insecticides are sprayed by use of airplanes?

Dr. BERTRAMSON. No, not on the matter of insecticides. We are quite concerned about it from the standpoint of herbicides and the damage to neighboring crops. It is quite interesting.

Mr. KLEINFELD. There have been instances of such damage to neighboring crops?

Dr. BERTRAMSON. Yes.

Mr. KLEINFELD. And the problem is being given consideration?

Dr. BERTRAMSON. Yes.

At this meeting that was held at Yakima, Dr. Telford, I presume there was some discussion of drift.

Dr. TELFORD. Yes. We had a conference with our pilots, and one of the points considered was the injurious effects of drift. The pilots are trying to reduce the errors of applications, reducing the losses to crops quite considerably. They are conscious of that and doing a fairly good job of it.

Mr. KLEINFELD. It is an educational program, apparently.

Dr. TELFORD. Yes.

Dr. BERTRAMSON. It seems to me in connection with that it is highly important for some sort of a checking system to be initiated so whenever any pilot goes out to fly, a log is made of the exact location where he is going to fly, the pattern in which he is going to fly and the direction of the wind.

For instance, in the case of herbicides, to come back a month later when the damage is visible on the crop and say, "Here it is. It must have happened when this fellow was flying over the area."

I think you would say that would not be a very good case—there would be no concrete evidence. Regardless of the bond he put up, there would be no way of establishing the connection that he was responsible for the damage.

Mr. KLEINFELD. No further questions.

Dr. BERTRAMSON. May I make one extra comment here on these herbicides and insecticides?

Mr. KLEINFELD. Surely.

Dr. BERTRAMSON. It seems to me a very fertile field for the soil chemist to study, what happens to these chemicals when they are put into the soil and how they fit into our picture of soil chemistry. We are beginning now in the State of Washington to study the effect of arsenic and how to get rid of it and how it behaves in the soil. We do have a project on that. It is very important to learn whether it behaves as an acid or as a base, and how it fits in with other things we know about the soil already.

Dr. MILLER. Is it also true, Dr. Bertramson, certain sprays you might use to kill weeds affect, for instance, tomatoes, potatoes, and so forth?

Dr. BERTRAMSON. I beg your pardon?

Dr. MILLER. Do some of these sprays affect plants like tomatoes and potatoes? For instance, I think we had a case of some fellow who used some spray along the road to kill the weeds and it drifted over onto the commercial tomato field. Great big plants grew, but no tomatoes. Are you doing some study along that line?

Dr. BERTRAMSON. Well, we know what the tolerances of various crops are for different chemicals, and the tomato is a most sensitive one. Just a trace of 2,4–D that might come from quite some distance—and you can detect a response by the peculiar way the leaf will turn just a little bit.

Dr. MILLER. The 2,4–D could drift over there with the wind quite some distance and destroy the tomato crop?

Dr. BERTRAMSON. Drift could be appreciable. Droplets 4 or 5 microns in diameter, released from a height of only 10 feet can drift 4 miles in a 3-mile-per-hour wind. For the benefit of the layman these droplets are the size of those in the mist of sea fog. Dr. Rasmussen, who is a consultant on herbicides and a weed research scientist for WSC, says airplane spraying of herbicides in the vicinity of sensitive crops is exceedingly hazardous to these crops.

Dr. MILLER. What about the use of parasites? I do not know whether you have Japanese beetles out here or not, but I believe they have something they place in the soil that gives the beetle a disease of some kind. I am not sure of the name of it.

Back in Washington a neighborhood was treated with a method of some kind, something they put in the soil that would get onto the beetle, and ultimately destroy the beetle. They are getting rid of beetles by that process.

I remember in western Nebraska we used to have a lot of grasshoppers and you could find a little mite under their wings. The grasshoppers died by the millions because of this parasite.

Dr. BERTRAMSON. That is right.

Dr. MILLER. Is there some natural enemy to these things that we could develop that would fight them without using chemicals on them?

Dr. BERTRAMSON. On the latter part of that question I will have to refer to Dr. Telford, who is an entomologist.

We have the goat weed out here. There is an Australian beetle which has been released in this area and in California that eats the goat weed. When the goat weed is destroyed, the beetle starves to death.

Mr. HORAN. It eats the seed. We are controlling about a hundred square miles in northern California that way.

Dr. BERTRAMSON. Yes.

Mr. HORAN. And we are working on the natural enemies of halogeton, too.

Dr. BERTRAMSON. Yes, sir. It is a serious poison weed in Idaho.

Dr. MILLER. The fruit industry has done quite a little on the red spider and other things, in bringing in their natural enemies. I wonder if that is not a new field that should be used more instead of trying to get some poison that is going to kill a specific bug?

Dr. BERTRAMSON. I wish you would call on Dr. Telford to make comment on that.

Dr. TELFORD. Generally speaking, these natural agents come too late and too few. If we would depend, for example, on some of the ladybug beetles to control our mites, I am afraid our fruit would incur considerable damage before these natural enemies would have an opportunity to build up sufficient numbers to be effective.

Mr. HORAN. We do use natural enemies. There is quite a traffic in ladybugs.

Dr. MILLER. Yes.

Mr. HORAN. But, as the doctor says, you take the bark beetle which attacks the spruce in some of our watersheds; its natural enemy is the woodpecker, but it is always about two blocks behind. So, while it is useful, it is not a cure; you have to supplement it.

Dr. MILLER. Doctor, Mr. Bromfield, of Ohio, was before our committee and testified about some crops he is raising both in Ohio and in Texas and over in France. His testimony was somewhat to the effect that if you have proper fertilizer and proper seed bed, you would not need this insecticide. He never used it, he claimed. I have not been on his farms, but he seems to get away from it. He does not use commercial fertilizers, he turns clover, alfalfa, and so forth, back under.

I think he testified before our committee that he did not use any commercial fertilizers. Have you read his testimony?

Dr. BERTRAMSON. Yes, I have.

Dr. MILLER. What is wrong with it? Why don't we follow that system?

Dr. BERTRAMSON. I think Mr. Bromfield may be growing plants less susceptible to insects than we in the Pacific Northwest. Another thing to consider is that when a plant is being grown under optimum conditions the injury to that plant is much less apparent than on plants which do not have vigorous growing conditions. I do not think we could depend on proper fertilization to control our plants here in the West, particularly on fruit. In regard to the natural enemies Dr. Miller mentioned, as with Japanese beetles, generally speaking these enemies which attack insects are normally present in our fields and our orchards and attack grasshoppers and house flies, and when conditions are optimum they will develop regardless of our own intervention. In the case of the beetle, however, they did run onto something they could inoculate the soil with and give control. By and large, the experimental evidence in that line has not been too successful.

Dr. MILLER. What happened to the grasshopper in western Nebraska when some parasite got under its wings? Where did that parasite come from?

Dr. TELFORD. We have several things that attack grasshoppers. We have a fungus, probably most prevalent and effective during days of rainy, cold weather. You have seen a grasshopper die with its legs attached to a twig or a standing piece of grain or corn? That is a result of the fungus infection. I understand it is present in fields and develops when we get a lot of rain. Our grasshoppers are generally economic species developed pretty much in conditions where we have considerable droughts. When we have years of drought we have these populations building up. We do have other parasites, competitors of grasshoppers, however, that do take care of them during certain years.

Mr. KLEINFELD. Dr. Bertramson, in your statement, on page 2, you talk about the use of selective dinitro compounds to kill weeds in grasses, peas, clovers, flax, and onions without damage to these crops.

Last year the Food and Drug Administration, with the cooperation of the Public Health Service, published a list of chemicals in use, or proposed for use, or which had been used in or on foods, and this is what was said about the dinitro compounds:

> All of the dinitro compounds are metabolic stimulants. They may also produce cataracts. This group of insecticides, therefore, presents a potentially severe public health hazard.

Do you know whether research to that effect has been done?

Dr. BERTRAMSON. No. I do know this: Some of my biological colleagues have informed me that all of our herbicides of these organics are in the nature of stimulants or hormones. That is the basis on which many of them act, and even DDT will show some sort of a hormone effect on tomato plants.

Mr. KLEINFELD. You are not in a position to talk about the pharmacological end of it?

Dr. BERTRAMSON. No; I am not in position to evaluate that.

Mr. KLEINFELD. I have no further questions.

Dr. HEDRICK. Any other questions?

Thank you very much.

Dr. BERTRAMSON. Thank you.

Dr. HEDRICK. Dr. Sumerford.

(The oath was administered by the chairman.)

TESTIMONY OF W. T. SUMERFORD, PH. D., TOXICOLOGY LABORATORY, TECHNICAL DEVELOPMENT SERVICES, COMMUNICABLE DISEASE CENTER, UNITED STATES PUBLIC HEALTH SERVICE, WENATCHEE, WASH.

Dr. HEDRICK. You may proceed.

Mr. KLEINFELD. What is your present position, Doctor?

Dr. SUMERFORD. I am currently in charge of the Wenatchee Field Station, Technical Development Services of the Communicable Disease Center, of the United States Public Health Service.

Dr. MILLER. You work in the United States Public Health Service?

Dr. SUMERFORD. Yes.

Dr. MILLER. And not the Food and Drug Administration?

Dr. SUMERFORD. The Technical Development Service of the Communicable Disease Center of the United States Public Health Service.

Mr. KLEINFELD. Has your training been in pharmacology?

Dr. SUMERFORD. Organic chemistry mainly.

Mr. KLEINFELD. Would you read your statement, Doctor?

Dr. HEDRICK. Or would you like to discuss your statement?

Mr. HORAN. Mr. Chairman, I think Dr. Sumerford is aware of some of the questions that have been asked, and I think he is better qualified than any of the witnesses we have had heretofore, for instance, to tell us how his laboratory determines what is deleterious to public health and what is not, and how he arrives at those levels, and that sort of thing. I think that is what the committee wants.

Dr. HEDRICK. Since that statement is going to be inserted in the record, just discuss these high points you are interested in.

Dr. SUMERFORD. Well, in determining the deleterious effects of these insecticides, the home laboratory at Savannah has made use of animal experiments to determine acute and chronic toxicity of these materials. About 6 or 8 months ago they established the field station at Wenatchee with a view toward correlating the work that went on at Wenatchee with that at Savannah and extending it somewhat in the clinical field.

The field station at Wenatchee has the services of a medical doctor who spends most of his time in the clinic, in the hospitals, and in determining the clinical picture with respect to these insecticides. However, we do not work independently of the group at Savannah, but rather in direct correlation with their activities.

There are a number of ways, of course, of approaching this. At the moment we are concerned with the determination of the amount of insecticides on the food crops in that particular area, also the amount of insecticides in the atmosphere, and also the determination of the hazards involved to those people who work in an atmosphere containing these insecticides or with these insecticides. For instance, we have taken blood samples of people who mix the material in a commercial plant in Wenatchee, Wash., and have done that now for a period of about 5 or 6 months. Another group with whom we work is the pilots who fly these formulations and apply them to various crops at various seasons of the year. A third group, of course, would be the individuals who spray their own orchards with liquid sprays.

Dr. MILLER. What do you do when you examine their blood, Doctor?

Dr. SUMERFORD. The test for parathion is the one in which we take the blood, preparatory to determining the cholinesterase level of the blood.

Dr. MILLER. Is that a difficult test?

Dr. SUMERFORD. It is fairly simple, sir.

Dr. MILLER. Is it accurate?

Dr. SUMERFORD. It is accurate in this respect: If you know the preseason level in an individual, then the postseason level is fairly indicative. But you cannot take a postseason level and compare it to the general population.

Dr. MILLER. Right.

Dr. SUMERFORD. Because we vary considerably in our levels to begin with.

Dr. MILLER. Individuals vary as to their absorption?

Dr. SUMERFORD. That is right.

Dr. MILLER. Do you do any urine tests on them?

Dr. SUMERFORD. We have to this extent. Parathion is metabolized first in the body to p-nitro phenol, which in turn is reduced in the body to p-amino phenol, and that material does appear in the urine of poisoned patients or people in an extent great enough to determine chemically.

Dr. MILLER. You have never had an opportunity to do any posts on people who have been around parathion a good deal—liver changes, and so forth?

Dr. SUMERFORD. No; we have none.

Dr. MILLER. Do you know of any that have been done?

Dr. SUMERFORD. The group in Savannah, of course, have done a number of them on animals. The only opportunity we have had to do a postmortem in this area of the country came about 6 or 8 weeks ago when a baby girl 8 months old died in Yakima from a clear-cut case of parathion poisoning.

Dr. MILLER. Acute or chronic?

Dr. SUMERFORD. Acute.

Dr. MILLER. You would not get any liver changes probably.

Dr. SUMERFORD. Not in that length of time, but that was the only opportunity we had to determine any post mortem findings.

Dr. MILLER. What were your findings?

Dr. SUMERFORD. Well, as I was preparing to say, we did not learn about this case unfortunately until a week after the child had died, and we have only investigated it from the standpoint of the testimony of the nurse, the parents, and the doctor.

Dr. MILLER. No actual autopsy?

Dr. SUMERFORD. No, sir.

Mr. HORAN. You are expecting to carry on some experimental work at the Marine hospital in Seattle.

Dr. SUMERFORD. That is right.

Mr. HORAN. Is that work under way?

Dr. SUMERFORD. It is and has been for several months. We, of course, come by cases of poisoning both by parathion and DDT and in those instances where Dr. Johnston, the medical man in charge of that work, thinks the case significant enough, he will carry these patients over to the Marine hospital in Seattle where they are subjected to intensive tests, clinical tests and physical tests of one kind or another.

Mr. HORAN. Mr. Kleinfeld inquired of Dr. Bertramson regarding the drift in application, especially from airplanes. Now you have done some work on that, have you not, at the Wenatchee laboratories?

Dr. SUMERFORD. We have taken air samples in orchards in which both spraying and dusting was being carried on, and also in adjacent territory. The concentrations that we have found up to this point and under the conditions in which we have studied it are not severe enough to cause us any great degree of alarm.

I think, if I might add a personal opinion here, the situation with respect to the drifting of the herbicide is explained on the basis of the fact the plant is sensitive to a far less concentration of this material than would be required to affect an animal in the case of a poison.

Dr. MILLER. Of course, your type of work will take many years of experimental work before you can come to any definite conclusion, and then sometimes you have to change what you think might be a

conclusion because of changes in reactions, and so forth. I think it is important the work has been carried on. How long has the laboratory been established, 2 years?

Dr. SUMERFORD. It was established actually in December of this year, but by the time they got the laboratory in and became organized, I believe it was April of this year that the first actual experiments were carried out, which was a comparatively short time.

Mr. HORAN. I was there. I think I was there at the time they had just begun.

Dr. SUMERFORD. That is right.

Mr. HORAN. They have done some drift experiments on the snow up near Leavenworth. They did that during the winter with colored dust.

Dr. HEDRICK. Are there any other questions?

Mr. KLEINFELD. I have one or two questions.

Dr. Sumerford, in the kind of work you and your fellow workers are participating, do you do much work with animals?

Dr. SUMERFORD. Here at Wenatchee, none so far. However, we are contemplating the introduction of some experiments at the Wanatchee station next season, next spray season, which will start in April or May, in which we hope to correlate our findings by checking the air samples with the symptoms of the animals which are held in the orchards at strategic points. The findings of Dr. Johnston with respect to blood cholinesterase levels and the DDT storage of the people who are in the orchards at the same time, will be related if possible, to the degree of air contamination.

Mr. KLEINFELD. Now, it's true, of course, that the results you get from animal experimentation are not conclusive as far as human beings are concerned. But you do feel that work on animals is rather important; is that not correct?

Dr. SUMERFORD. I think it is the only way we have to arrive at what might be the situation with respect to human beings. I think we have to pass through the animal stage and draw the best conclusions we can from that.

Of course, we have by the judicious selection of the test animal and the use of human volunteers certain opportunities to determine on the borderline cases. In other words, we try to build it on that sequence so we will know and can better translate other earlier findings with the lower animals with what we might expect in humans.

Mr. KLEINFELD. In other words, although you cannot translate the animal data exactly as far as human beings are concerned, you do get very valuable information, do you not?

Dr. SUMERFORD. We certainly do.

Mr. KLEINFELD. You wouldn't want to say that since we can't translate animal data exactly as far as human beings are concerned, we should therefore ignore animal experimental work and use the insecticide on humans and say, "We will watch it, and if anything happens that is wrong, we will stop it"?

Dr. SUMERFORD. I agree. I think we should study the effects on the animals.

Mr. KLEINFELD. Rather than follow the human guinea pig approach?

Dr. SUMERFORD. Yes.

Mr. KLEINFELD. Do you perform any LD–50 tests on these animals?

Dr. SUMERFORD. At Savannah.

Mr. KLEINFELD. Tell us about them.

Dr. SUMERFORD. An LD–50 is that dose of a drug or insecticide or chemical which will kill 50 percent of the animals to which it is administered. Of course, they have means of determining the LD–50 even though the exact 50 percent did not die. I mean they have curves which they use to obtain such information as that.

Mr. KLEINFELD. Very often you use rather massive doses in your LD–50 work, do you not?

Dr. SUMERFORD. In some instances. It has been said, for example, in the case of methoxychlor, that you are unable to determine the LD–50 in the small animal because you can't have him swallow enough to give him an LD–50 dose.

Mr. KLEINFELD. What helpful data do you get from an LD–50?

Dr. SUMERFORD. I feel that an LD–50 is comparatively an easy thing to arrive at, comparatively easy because you use animals which are plentiful and you can use them in fairly large numbers. It will at least tell you what you might expect from this particular chemical on the basis of the acute toxicity, and give you some sort of comparison to other chemicals already in use, to judge as to where you stand with respect to them.

Mr. KLEINFELD. Does it help you in connection with your chronic toxicity work?

Dr. SUMERFORD. In some instances there is a direct connection between acute toxicity and chronic toxicity; very frequently there is not.

Mr. KLEINFELD. Sometimes you get some relevant data bearing on chronic toxicity, but usually you get data on the acute toxicity?

Dr. SUMERFORD. That is right. And on the LD–50 I would say that in some cases it is practically worthless for determining chronic toxicity.

Mr. KLEINFELD. Well, to put it roughly as a layman, the LD–50 test gives you a hint as to what to look for; is that not true?

Dr. SUMERFORD. That is right. It gives you a hint as to what you can expect from this material if it should be swallowed as in the case of the infant 9 months 17 days old in Yakima.

Mr. KLEINFELD. If you have an LD–50 and you have determined the dose that will kill 50 percent of the animals, in following your experimental work, in performing autopsies, and so on, you get at least some idea, some hint, of what you may expect from the continued ingestion of that particular compound?

Dr. SUMERFORD. In some instances; yes.

Mr. HORAN. Will you be able to find new answers to some questions that have been raised and have not been answered yet regarding any relationship between pesticides as a group or insecticides and the possible development or encouragement of cancer?

Dr. SUMERFORD. I know of no relation that has been published at any rate, in which they have been able to show that the use of this particular insecticide is conducive to the development of cancer.

Mr. HORAN. Would you be able to find out whether or not continued exposure to the use of pesticides means it accumulates in the body and builds up and stays in the tissues and increases?

Dr. SUMERFORD. Yes. Two of our experiments certainly would show some light on that situation. We take small fat samples in

elective surgery at Wenatchee. We have taken now almost a hundred, I believe, of such samples. Those samples are routinely analyzed for DDT content to tell us the storage in the individual of the DDT—that is, the DDT content of his body. After that value has been determined, or before it has been determined, as a matter of fact, we take a case history of that individual, and on the back of my statement you will find a sample of the form—Toxicology form No. 17—which we use.

Dr. MILLER. Experiments carried out by the laboratories rather definitely determined that DDT, for instance, is stored up in the fat and is accumulated. Is that not true?

Dr. SUMERFORD. That is true.

Dr. MILLER. That is in the literature you have?

Dr. SUMERFORD. That is true, sir.

Mr. HORAN. You will find out a lot of information covering that phase of it?

Dr. SUMERFORD. Yes. As a matter of fact, the laboratory at Wenatchee, or the field station at Wenatchee, is more concerned with chronic toxicity than it is with acute toxicity by the very nature of its work, and the very nature of its operation.

As I have said earlier, it is an extension of the work at Savannah, and there they are concerned mainly with the work of acute toxicity.

Dr. HEDRICK. We had a witness before us in Washington who thoroughly believes that DDT is responsible for virus pneumonia. What do you think about that? Have you had any literature on that?

Dr. SUMERFORD. I have read three or four papers, and I have read the testimony presented to this committee, some of which contradicted his findings. In my own way of thinking, I see no relation between the virus infection he spoke of and DDT poisoning. I cannot agree with that.

Dr. HEDRICK. Are there other questions?

Mr. KLEINFELD. No, sir.

Dr. HEDRICK. We thank you very much for coming before the committee, Doctor.

Dr. SUMERFORD. Thank you.

(Dr. Sumerford's statement is as follows:)

A STATEMENT ON THE TOXICOLOGICAL STUDIES OF THE UNITED STATES PUBLIC HEALTH SERVICE FIELD STATION AT WENATCHEE, WASH., BY W. T. SUMERFORD

It is generally accepted that chemical agents must be used to control insects which interfere with the production and preservation of man's food, clothing, and shelter. All chemical agents now used to control insects are, to a varying degree, poisonous to all warm-blooded animals, including man. Furthermore, it is highly improbable that an insecticide will be discovered which will be noninjurious to man and the other higher forms of life.

Since insecticides are poisonous and yet their use is established, it is necessary to evaluate the health hazards which attend their production, formulation, and application, or consumption in minute quantities. The evaluation of the health hazard of a given insecticide involves, among other things, a study of its physical properties, its chemical properties, a determination of its acute and chronic toxicity and the time and manner of its application.

The United States Public Health Service, through the Technical Development Branch of its Communicable Disease Center, maintains a laboratory at Savannah, Ga., in which the acute, subacute, and chronic toxicity of selected insecticides is determined. The insecticides are administered dermally, orally, and by inhalation to laboratory animals which are then observed for physiological and anatomical disturbances.

For the purpose of broadening and extending the toxicological work at Savannah, additional laboratory facilities were set up at Wenatchee, Wash., in April 1951. The principal function of the Wenatchee station is to determine the degree of exposure to insecticides of people who live in an area in which relatively large amount of insecticides are applied per unit area. The investigations are mainly designed to uncover possible cases of chronic poisoning from these exposures. The insecticides to which the most attention is now paid are DDT and the organophosphates, mainly parathion and TEPP.

This problem is being approached at the Wenatchee station from two directions: (*a*) qualitative and quantitative determinations of human exposure to important insecticides are made by chemical means and (*b*) clinical studies are carried out in order to determine the physiological effects in humans who have had varying degrees of exposure to those insecticides under investigation.

DETERMINATION OF EXPOSURES

Oral: Insecticides may be ingested through eating certain food products, e. g., fruits from sprayed orchards, vegetable produce to which insecticides are applied at some stage of their growth, and food products from animals which are, themselves, exposed to insecticides. Those food products which are most likely to be contaminated are analyzed for the indicated insecticide.

Inhalation: This type of exposure to insecticides is greatest in those areas where relatively large amounts per unit area are applied, and especially from aircraft. More particularly, laborers in commercial insecticide plants, mixers of formulations, spray crew operators, pilots and associated personnel are subject to the inhalation of insecticides. To determine the degree of this exposure measured samples of air are collected from the atmosphere of operations involving the mixing and application of insecticides and analyzed for their insecticide content.

Dermal: Personnel working in operations involving the mechanical and power mixing and application of insecticide formulations, are subject to dermal exposures to insecticides. This type of exposure is estimated by having the exposed operator wear surface patches which are designed to collect and hold any insecticide formulation which touches them. These patches, which are worn on various parts of the body, are collected after stated intervals of exposure and analyzed for the amount of a given insecticide which they are holding. The dermal exposure of an individual in a given situation is calculated from these data.

RESULTS TO DATE

Survey of spraying practices: A survey was made of spray practices used in this horticultural area preliminary to collecting air samples from atmospheres which might be contaminated by such applications. The results of this survey are shown in table 1 (liquid applications) and in table 2 (dust applications).

TABLE 1.—*A summary of the rate of application of DDT and parathion liquid formulations in 52 north-central Washington orchards*

Values of rates and concentrations	Spray, gallons per acre	DDT			Parathion		
		Pounds per 100 gallons of spray	Percent formulation, weight by volume	Pounds per acre	Pounds per 100 gallons of spray	Percent formulation, weight by volume	Pounds per acre
Highest	2,500	50.0	6.00	18.7	25.0	3.0	5.0
Lowest	20	.45	.06	2.0	.07	.01	.06
Mean	746	5.04	.61	9.1	1.4	.17	1.9

TABLE 2.—*A summary of the rate of application of DDT and parathion dust formulations in 47 north-central Washington orchards*

Values of rates and concentrations	DDT				Parathion		
	Dust pounds per acre	Pounds per 100 pounds of dust	Percent formulation weight by volume	Pounds per acre	Pounds per 100 pounds of dust	Percent formulation weight by volume	Pounds per acre
Highest	60	25.0	25.0	12.5	4.0	4.0	2.0
Lowest	50	17.9	17.9	10.0	2.0	2.0	1.0
Mean	51	21.3	21.3	11.0	2.8	2.8	1.4

From a toxicological standpoint the most important revelations in these tables are that DDT is applied in the fruit orchards of north central Washington at rates of 2 to 18.7 pounds per acre and parathion is applied at rates of 0.66 to 5 pounds per acre. The average rate of DDT and parathion per acre is 9.46 pounds and 1.79 pounds respectively.

Air samples: Forty-three sample of air were collected in sprayed orchards and in other areas in which insecticidal formulations were being mixed and/or applied. The range of parathion concentration found in selected areas is indicated in table 3.

TABLE 3.—*A summary of the parathion concentrations found in 43 air samples collected in apple orchards and other areas in which parathion was being mixed or applied*

Location of sample	Number of samples	Size of sample (average)	Parathion concentration gamma per liter		
			Highest	Lowest	Mean
Orchard during spraying	28	407	[1] 1.59	[1] 0.02	[1] 0.46
Adjacent to orchard	6	129	.26	.06	.11
Individual mixing tank	6	267	3.95	.28	2.35
Commercial mixing plant	3	1,131	.77	.19	.41

[1] These concentrations were found in orchards receiving from 0.30 to 5.0 pounds per acre of DDT.

There is a considerable range in the concentration of parathion in the atmosphere of each of the locations described in table 3. However, the atmosphere of the individual mixing tank was highest with a gamma per liter concentration of 2.35 which is considerably higher than the atmosphere contamination in a commerical mixing plant. The concentration of parathion in the atmosphere of an area adjacent to an orchard is about one-fourth that of the orchard during spraying.

CLINICAL INVESTIGATIONS

General cases: Contacts are made with a number of individuals who believe they are suffering from the effects of insecticide poisoning. Detailed case histories (see p. 3 of attached form) are taken on these individuals. If their symptoms can be attributed to insecticide poisoning, a sample of their fat is analyzed for DDT storage and a blood sample is drawn in order to determine the patient's cholinesterase level, which is low in the event of organophosphate intoxication.

If the symptoms and the results of the clinical test described above so indicate, an attempt is made to admit the patient to the marine hospital in Seattle where additional tests, e. g., liver and kidney function tests, electrocardiography and neurological examinations including electroencaphalography and carried out to determine the extent of the physiological disturbances produced by the insecticide.

DDT storage in humans: A second check on the possible exposure of a population to DDT is made in this way: DDT analyses are made on fat samples of a number of people who come to elective surgery. The history of exposure to insecticides of such patients are secured (see pp. 1, 2 of attached form) and an attempt is made to correlate this with the amounts of DDT found in the fat sample as well as with any symptoms which can be attributed to DDT poisoning.

Exposure to organophosphates: A third phase of the clinical investigations makes use of the determination of human cholinesterase levels as an index to poisoning by parathion and other organophasphates.

Selections are made among the general population of groups of individuals who vary in their exposure to the organophosphates, e. g., formulators in an insecticide plant, spray crews, aircraft applicators, individuals living near sprayed orchards, etc. Cholinesterase determinations are made in these individuals before, during, and after the spray season when their exposures are the highest. Here, as in the case with DDT, histories of their exposure and their symptoms are recorded in as much detail as possible. The symptoms, supplemented by cholinesterase levels, are compared with the degree of exposure for the purpose of correlation.

Acute toxicity: While the studies described here are mainly concerned with the effects of subacute doses of insecticide, the few reported cases of acute poisoning by insecticides are investigated. Information on antidotes is freely given, appropriate clinical tests are made, and complete case histories are taken and filed for future reference.

DDT in human fat samples: In order to determine how much DDT the population is accumulating, the Wenatchee field station is obtaining fat taken from patients who are undergoing surgery. These samples are obtained through the cooperation of the local physicians. Although the number of sampled patients is not great, the results obtained to date indicate some relationship between the amount of exposure and the amount of DDT accumulated when the results are averaged even though when the results are analyzed separately there seems to be no correlation between the amount of exposure and the amount of DDT accumulated. None of the patients examined exhibited any signs or complained of any symptoms which might be attributed to DDT intoxication. Careful histories directed at obtaining specific exposure and casual exposure to DDT enabled us to group our patients into the following categories: Moderate, slight, and no known exposure. All results shown in the following table are expressed in parts per million.

TABLE 1

Amount of known exposure	Highest accumulation [1]	Lowest accumulation [1]	Number patients in group	Mean [1]
Moderate	12	5	6	7.1
Slight	25	0	18	6.66
None	22	0	10	4.6

[1] In parts per million.

RESULTS TO DATE

Cholinesterase levels in organophosphate exposures: The results obtained at the Wenatchee Laboratory during the spray season 1951 enabled us to draw some definite conclusions concerning the over-all toxicological aspects of the organophosphates; to suspect certain conclusions are valid; and finally the results led to some problems which will need more research.

First, it has been clearly demonstrated that each individual has his own cholinesterase level which may be considered as normal or nonexposed level. Therefore, the individual's cholinesterase level at any given time may be more accurately expressed in terms of his own normal rather than in terms of a population average. We have found that children exhibit a higher plasma

cholinesterase level than adults. We have found that the plasma level is nearly always higher than the red-blood-cell level. For example:

TABLE 2.—*Preseason cholinesterase values shown to demonstrate variations in nonexposed individuals*

	Red blood cell	Plasma	Age group
Case No. 86	0.735	0.960	Adult.
Case No. 99	.609	[1] 1.334	Do.
Case No. 115	.585	.611	Do.
Case No. 82	.660	1.445	3 years.
Case No. 117	.700	1.065	5 years.
Case No. 118	.665	1.075	6 years.

[1] Highest result found in over 250 adult cases.

From the results, it is indicated that the following statements are generally true; however, they need further verification.

(1) That every human has his own individual tolerance to the organophosphates, but that every human exposed to organophosphates will show a depletion of his cholinesterase level.

(2) There is often a marked variation in the ability of individuals to regenerate the cholinesterase enzyme.

(3) That the plasma cholinesterase is more labile than the red-blood-cell cholinesterase in that it will show a depletion sooner and its recovery will be faster.

TABLE 3.—*Showing cholinesterase levels from differently exposed individuals*

	Preseason		Exposure	During season		Postseason	
	C	*P*		*C*	*P*	*C*	*P*
Case No. 28	0.850	0.825	Heavy every day	0.429	0.283	0.490	0.740
Case No. 16	0.400	0.750	Moderately heavy daily	[1] 0.468	0.283	0.515	0.586
Case No. 20	0.425	0.950	Moderate every week	[1] 0.745	0.621	0.815	0.935
Case No. 147	0.720	0.810	One spray job only	0.464	0.652	0.584	0.735
Case No. 80	0.865	1.065	Very casual, neighbor sprayed orchard.	0.745	0.950	0.795	0.753
Case No. 128	0.783	0.960	No known exposure	0.756	0.970	0.715	0.960

[1] Suggests greater regenerating capacity in those chronically exposed to organophosphates.

Dr. HEDRICK. We wish to thank all the witnesses who have appeared before this committee. They have been very instructive, and I am sure their evidence will be beneficial to us. We will take it back to Washington and study it.

We thank you very much. The committee will stand adjourned.

(Whereupon, at 3:30 p. m., the committee recessed to reconvene in Seattle, Wash., at 9:30 a. m. Saturday, November 17, 1951.)

CHEMICALS IN FOODS AND COSMETICS

SATURDAY, NOVEMBER 17, 1951

HOUSE OF REPRESENTATIVES,
SELECT COMMITTE TO INVESTIGATE THE USE OF
CHEMICALS IN FOODS AND COSMETICS,
Seattle, Wash.

The select committee met (pursuant to H. Res. 74 and H. Res. 447, 82d Cong., 1st sess.; continuing the investigation and study begun under authority of H. Res. 323, 81st Cong., 2d sess.) at 9:30 a. m., in fourth-floor courtroom, United States Courthouse, Seattle, Wash., Hon. Paul C. Jones presiding.

Present: Representatives Jones of Missouri, Miller of Nebraska, and Horan of Washington.

Also present: Vincent A. Kleinfeld, chief counsel, and Alvin L. Gottlieb, associate counsel.

Mr. JONES. The committee will be in order. Mr. Horan will be here in just a moment. He has been here.

As most of you know, this is the select committee that has been conducting studies on the use and effect of chemicals in food. This is our first visit to the Northwest. Most of our hearings have been confined to Washington, D. C., with the exception of a series of hearings conducted in Chicago. We are here, as you know, at the request of different parties in the Northwest to assemble information we hope will be helpful in the study of this problem, which we all recognize is a most important one.

Without further ado, we will start this hearing. We will try to move along as rapidly as possible. We have six or seven witnesses this morning. If possible, we would like to go through the noon hour and complete the hearing. If it appears at a later time that we will not be able to do that, we will take a short recess for luncheon and return.

I would like each witness to make his remarks as brief as possible. However, we do not want to prevent anyone from getting all the information he feels he has in this record, and we will try to make our questions as pertinent as possible and to make them as brief as possible.

Who is your first witness, Mr. Kleinfeld?

Mr. KLEINFELD. Mr. Steenland.

Mr. JONES. Mr. Steenland, I see that you have a prepared statement. If you would like to read this statement, that will be satisfactory to the committee, or it might be that you would just like to put the statement in the record and make such brief comments as you think pertinent.

Mr. KLEINFELD. It is a little over two pages. I think he might as well read it.

Mr. JONES. It is the custom for witnesses before this committee to be sworn.

(The oath was administered by the chairman.)

Mr. JONES. Proceed.

TESTIMONY OF ADIN P. STEENLAND, PLANT-PATHOLOGY SPECIALIST, OREGON STATE COLLEGE EXTENSION SERVICE, CORVALLIS, OREG.

Mr. STEENLAND. The statement that I will read has been concurred in by Dr. S. M. Dietz, chairman of the department of botany and plant pathology; Dr. E. K. Vaughan, who heads up the vegetable and small-fruit work of the department of botany and plant pathology; and Dr. Frazer, who heads up the vegetable work for the department of horticulture. I, however, prepared the whole statement and they concurred in it.

My name is Adin P. Steenland. I am plant pathology specialist for the Oregon State College Extension Service. I was born at Palisades Park, N. J., on March 31, 1919, and was educated at the University of Georgia, 1938–42, B. S. in agriculture; commenced graduate work at Cornell University in 1942, but left for the Navy in 1942. Graduate work in plant pathology at Cornell University was resumed in 1946. No degree was received, as I left in 1947 to join the staff of the Oregon State College Experiment Station.

My professional experience includes duties as follows: assistant plant pathologist and geneticist, Campbell Soup Co., 1940 to 1942—I might insert that there is an overlap. That work was done primarily during the four summer months, that is, June to September, but I carried the title even while I was at college. Assistant plant pathologist, Oregon Experiment Station, 1947 to 1949. Plant pathology specialist, Oregon State College Extension Service, 1949 to present. During the course of these duties I have conducted research on diseases of vegetable, orchard, nursery, and essential oil crops; breeding of vegetable crops, and grower educational—extension—work on diseases of orchard, vegetable, nut, small fruit, cereal, forage, nursery, ornamental, and essential oil crops. I am a member of the American Phytopathological Society, the Western Cooperative Spray Conference, and the Northwest Smut Control Committee.

At the Food and Drug Administration hearings I presented evidence regarding the use of chemicals for the control of 32 diseases of crops in Oregon. Several of these 32 attack more than one crop. This was entered as exhibit 234. No evidence was presented regarding the use of chemicals as seed treatment materials for control of plant diseases. I also presented testimony at Food and Drug Administration hearings. Evidence was also submitted to the committee chosen to represent the American Phytopathological Society. This was entered as part of exhibit 787.

At the present time there are 15 fungicides recommended in Oregon for control of diseases of food crops, and four of these are seed treatment materials. Frequently these materials are applied at a time of year when none of the edible product of the crop is present. Peach leaf curl is an example of a disease which can be controlled with chemicals by making the applications when the trees are dormant;

thus, no material is put on the fruit. It is also an example of a disease that would wipe out an industry if it were not for chemical control.

I might insert that the industry would be strictly in the Willamette Valley. That is what I am talking about, not the entire peach industry. The climate in western Oregon is very favorable for the development of the curl-causing organism, and unsprayed trees of the present commercial varieties will not produce a crop, and if left unsprayed for two or three successive years will be killed.

Brown rot of stone fruits affects peaches, cherries, prunes, plums, and apricots in Oregon. In most years this is a serious disease in its blossom-blight phase. The wet weather which usually occurs in certain parts of Oregon during the blossoming of the stone fruits favors the development of the organism which causes brown rot. Peach crop failures caused by this disease are not uncommon and serious losses are experienced on the other stone fruits. The organism that causes the blossom blight phase of brown rot is the same as the one that causes the fruit rot. The chemicals used for control of blossom blight are applied before the fruits are present and therefore puratized agricultural spray, a mercury-containing material that has been found excellent for control of brown rot, is recommended for this period, but only materials believed to be nontoxic are recommended for control of the fruit rot.

The production of fancy pears for the gift-box trade is very important in Oregon. Scab is, in certain seasons, a serious disease on pears but it can be controlled with lime-sulfur, ferbam, and some other chemicals. Of the materials which are known to be useful in the control of pear scab, only ferbam can be used on Comice and Anjou pears, as the others cause a very objectionable russet.

Several applications are made when the fruit is on the tree. Ferbam acts only to protect against infection by the scab-causing organism, whereas several other chemicals have the ability to kill the fungus even after infection has taken place.

There is, therefore, a continuing search for a material which will not induce russetting and will also have the ability to kill the scab-causing fungus after infections have occurred. If in the course of research, such a material were found it could be of great help to Oregon pear growers, but its use could also result in heavy losses financially. To explain this statement, it is necessary to deal with the problem of pesticide recommendations and a hypothetical case will be used to clarify the situation. Here I want it clearly understood that I speak for the State of Oregon only.

A certain chemical is found by thorough testing to fulfill the needs mentioned above. In the course of the research studies, no human injury has occurred, and the manufacturer of the chemical knows of no injury to humans from its use. The manufacturer has had toxicological tests made and these indicate that the chemical is safe or at least is considered to be nonharmful when used as recommended. The research plant pathologists then may recommend the use of this chemical to pear growers for the control of scab.

The pear growers may in turn use this chemical, and control of scab may be excellent. The pears may then go to the packer and ultimately into interstate shipments as either fresh or processed fruit. Here, for the first time, other States or Federal agencies become involved. It may be that the Food and Drug Administration has information

to prove that the use of this chemical on pears makes the fruit unsafe for human consumption, and shipments are seized and the sale of the pears is prohibited. Along this chain of events, each party has acted in accordance to the best advice he had, but nevertheless a serious loss occurred. This loss must be borne either by the packer or by the growers if the packer is a cooperative. The research workers are also placed in disrepute and that through no fault of their own.

It would seem that the recommendations for the use of chemicals should be made only after the recommendations have passed a board of control. This board of control should be set up on a regional basis and recommendations passed by it would have been approved by the Food and Drug Administration.

This board would have to meet regularly so as to act on all proposed recommendations promptly. This board would have to be composed of authorities in the various fields involved, including a representative of the Food and Drug Administration. Three or four regional boards would be highly desirable as certain problems are regional and familiarity with the problem is essential. The mechanics of setting up such a board, its personnel, functions, and many other details would require a thorough investigation and it is therefore suggested that the House of Representatives Select Committee To Investigate the Use of Chemicals in Food Products consider this proposal and if it deems it advisable, secure authorities in the fields involved to investigate fully this proposal and make detailed recommendations.

Mr. JONES. Thank you, Mr. Steenland.

Do the members of the committee have some questions? Dr. Miller, you have any questions?

Dr. MILLER. Yes; I have one or two questions.

You said in your third paragraph, Doctor, "chemicals for the control of 32 diseases of crops in Oregon."

Would you say there are only 32 diseases that affect the crops in Oregon?

Mr. STEENLAND. No, sir. In 32 of the diseases we do use chemicals for their control. There are more than that, but how many more——

Dr. MILLER. You do not mean to say there were just 32 diseases?

Mr. STEENLAND. No.

Dr. MILLER. How many additional diseases do you think need control?

Mr. STEENLAND. There are probably four or five more that need control but, at the present time, we do not know the life history of the organisms. We have no information regarding how to control them. We have tried hit-and-miss methods of application of fungicides, but we are not satisfied regarding any of these. We need control, but we don't know how to get it.

Dr. MILLER. I note, also, that you say there are only 15 fungicides recommended in Oregon for control of diseases of food crops.

Mr. STEENLAND. That is right, sir.

Mr. HORAN. Might I interpolate there, Doctor?

Dr. MILLER. Yes.

Mr. HORAN. I think we will get a better answer to that if we divide those things which trouble producers in the production of a food crop—if we will divide those things which will endanger those crops into the various types of things which might attack those crops. You

have mentioned fungus and you have mentioned molds and you have mentioned insects, and you have——

Mr. STEENLAND. No insects were mentioned.

Mr. HORAN. Blight, and a lot of these other things. I think if you will go into it you will find there are about 500 possible enemies to a producing crop. However, the types of sprays we use tend to give a blanket protection against a lot of them, which, if you do not use them, you will find them creeping in here and there.

Mr. STEENLAND. That is right. I want to make it clear here that I am not speaking on insecticides at all. I am not an authority in that field.

Dr. MILLER. These are just fungicides?

Mr. STEENLAND. I am just speaking about fungicides and fungi. I am also including, in this, bacterial diseases. In other words, generally speaking, the field of plant pathology and the materials used for control of diseases are termed fungicides. That also in the case of pear blight, and apple blight would include bactericides, because that is bacterial organism. But coppers that are used are generally spoken of as fungicides rather than bactericides. In the strict sense of the word they are used as bactericides.

Mr. HORAN. You do not mention virus.

Mr. STEENLAND. We have no control in the field of chemicals for virus disease at the present time. Your plant diseases are in several fields. You have your diseases caused by fungi, diseases caused by bacteria, and diseases caused by viruses; also nematodes, which are a border-line case. We have no control for the virus disease at present.

Dr. MILLER. I would like to pursue this a little further. You say 15 fungicides are recommended to control diseases in food crops. I suppose you mean the fungi?

Mr. STEENLAND. And bacteria.

Dr. MILLER. Of those 15 that you recommend would you say that any of them were toxic to the human being?

Mr. STEENLAND. Yes. The mercury-containing materials are certainly toxic. Puratized agricultural sprays which we recommended in the blossom stage for the control of brown rot on various stone fruits are very definitely toxic materials.

And seed treatment materials which we certainly would not apply; that is, we do not apply them to the portion that is used unless the vine were to go into livestock feeding.

Dr. MILLER. But many of them are toxic.

Mr. STEENLAND. Not the ones applied on the food itself or the edible portion itself.

Dr. MILLER. Just the blossoms?

Mr. STEENLAND. Yes.

Dr. MILLER. What about stone rot?

Mr. STEENLAND. Blight and the brown rot.

Dr. MILLER. The brown rot.

Mr. STEENLAND. The ones that we recommend for application durinug the fruiting period when the fruit is on the tree, we do not, as far as we know, have any indication that they are toxic.

Dr. MILLER. I notice you say on page 2 that only materials believed to be nontoxic are recommended for control of fruit rot.

Mr. STEENLAND. Right. The materials that we recommend, such as ferbam.

Dr. MILLER. What is ferbam?

Mr. STEENLAND. Ferbam is the common name. It is ferric dimethyldithio-carbonate.

Dr. MILLER. That is toxic?

Mr. STEENLAND. It is considered relatively nontoxic.

Dr. MILLER. It depends on how much you take.

Mr. STEENLAND. Yes; that is true.

Dr. MILLER. Let's be specific about it. If you take enough of ferbam then you could make yourself ill?

Mr. STEENLAND. As far as the verbal clearance on that, I discussed that when I was at the Food and Drug Administration in Washington a year ago in February and we were given to understand that they were not concerned at the way we were using ferbam.

Dr. MILLER. Did you consider DDT toxic?

Mr. STEENLAND. I am not a toxicologist and not in a position to speak on it.

Dr. MILLER. You would not care to answer that?

Mr. STEENLAND. No.

Dr. MILLER. Is there anyone in this group who would know whether DDT is toxic? Is there anyone in your group who would?

Mr. STEENLAND. I am the only one from the State of Oregon. There are, however, I believe some——

Mr. KLEINFELD. I think perhaps we will develop that from other witnesses, Dr. Miller.

Dr. MILLER. All right.

Mr. STEENLAND. I sat in at the Food and Drug hearing for 3 days before I got on the stand, and I heard them question a few of them who made statements as to whether they were toxic or not.

Dr. MILLER. The research plant pathologist then may recommend the use of a chemical. Who are these research pathologists in your hypothetical case? Who selects them and who are they?

Mr. STEENLAND. In this hypothetical case the persons who would be involved in that at the present time are myself; Dr. Ken Holtz, who is the plant pathologist for the United States Department of Agriculture station a Hood River; Dr. S. M. Dietz, chairman of the department of botany and plant pathology.

Dr. MILLER. Who would appoint the board that you say might be appointed to make recommendations which might overrule the Food and Drug Administration? Who would appoint such a board? I notice you say something about who might be on it, Doctor. But I suppose that would be a political board selected by the Governor—or how would it be appointed?

Mr. STEENLAND. Let me clarify my statement there just a minute. I do not feel that we should overrule the Food and Drug Administration. I didn't mean that to be understood that way at all. I believe the Food and Drug Administration has a very definite need in our set-up. To elaborate on this hypothetical case a little bit—we find at least as far as the State of Oregon is concerned that a material is successful for its use. We have no way that I, at least, know of, or that any of these others that I consulted with know of, where we can get complete clearance on that material to be certain that if it is used on a crop and that crop goes into interstate commerce that it will not be seized by the Food and Drug Administration.

We feel that a reasonable committee, not a State committee, in other words, we feel there that as far as our State of Oregon is concerned we know what certain of the problems are at least. We do feel that a reasonable committee to approve the use of these materials is highly desirable for this northwestern region. We have many things in common. West of the Cascade Mountains these diseases which we have in Oregon are almost identical with those west of the Cascade Mountains in Washington. We work very closely together through the Western Cooperative State Conference. Our problems are discussed there. We, so to speak, can let down our hair, and discuss the research that is current.

Dr. MILLER. Would you have a separate board for pears and apples, and asparagus?

Mr. STEENLAND. No; otherwise, it would become too cumbersome and not be usable at all. It would bog down in red tape.

I think on this board there should be a plant pathologist and an entomologist; there should be someone from the Public Health Service.

Dr. MILLER. The Food and Drug Administration?

Mr. STEENLAND. The Food and Drug Administration by all means. We want a complete coverage so that these men are familiar with the situation when the material is brought before them or presented to them for its approval, so that they are capable of determining whether the research has been adequate in the first place; whether the material is one that could be used as recommended. Then it also would have passed the Food and Drug Administration before. Now I am not saying that the Food and Drug Administration's hands should be tied so that further evidence would not prevent its being used.

Dr. MILLER. I like that approach. I think it is all right.

Mr. STEENLAND. We think that research should be continued. But at the present time we are not able to make determinations before our recommendations are made. That is what we need. I believe we are putting the cart behind the horse. We are not putting the cart before the horse, but we are putting it away too far behind it.

Dr. MILLER. I think that is all.

Mr. JONES. Thank you.

Mr. Kleinfeld, do you have any questions?

Mr. KLEINFELD. Yes.

Mr. Steenland, to summarize, the main theme of your statement is that not only from the viewpoint of the consumer, but also from the viewpoint of the grower, it is important that the grower know before his product is shipped whether or not it is safe and whether it is considered to be safe by the enforcement authorities?

Mr. STEENLAND. That is right, also by the packer.

Mr. KLEINFELD. By the packer?

Mr. STEENLAND. Yes.

Mr. KLEINFELD. So we have these interests involved—all really aiming at the same general end?

Mr. STEENLAND. That is right.

Mr. KLEINFELD. And it is very important, in that connection, that we know what the residues are of the fungicide or insecticide which may be used. Is that correct?

Mr. STEENLAND. That is correct.

Mr. KLEINFELD. And it is equally important that we have, particularly the packer or canner, adequate methods of analysis?

Mr. STEENLAND. That is right.

Mr. KLEINFELD. For example—you are not familiar with the insecticide field, are you?

Mr. STEENLAND. I would not want to speak on it. I am familiar with it to a limited extent. I, of necessity, listen to many of their discussions and we work rather closely with them, because in many cases a dual application is made. The fact is we always look for a dual application because at the present time, with the cost of labor, it is not the cost of materials that go into the spray, but it is the cost of putting it on. So if we can put on an insecticide and fungicide at one time, of course, that is the sensible thing to do. So we work very closely together.

Mr. KLEINFELD. And you would think that when a product is proposed by a chemical manufacturer for use as a fungicide or as an insecticide, information should be furnished, at the time it was submitted to the board of which you speak, with respect to the residues, methods of analyses, and so on?

Mr. STEENLAND. That is right. Even before that time some information should be furnished to whatever authority is going to, whatever Government agency is going to run these tests.

Now the way it works in our experience—a company will develop a material. They will run some preliminary analysis on it to determine whether it does have fungicidal properties. Then they will send those materials out to the various experiment stations. We have quite a few of them because of our extremely wet winter weather and we serve as a pretty good screening area for some of these various diseases. There are some of them that we have more of a problem in Oregon than almost any other area in the United States. So we get a fair number of these materials in the early stages. It will take us 2 to 3 years before we really know what is going to happen. We will have a 2- to 3-year period that toxicological information can be developed. So that information would be available at the time that we are ready to make the recommendation to our growers. Rather than waiting the 3-year period to find out that this material is good and then have to wait for the toxicological information, we would rather see them going along at a simultaneous pace. If the material fails, that is, it is not up to par, then the toxicological work would be dropped in its early stages. I realize that would induce in some cases unnecessary expense, but I do not believe that the expense of carrying on that program in the early stages would outweigh the benefits that would be received for the materials that would later be recommended.

Mr. KLEINFELD. Do you think that we should have this information before the product is put into general use?

Mr. STEENLAND. Yes.

Dr. MILLER. Certainly before we poison too many people we should know what it is going to do.

Mr. KLEINFELD. I have no further questions.

Mr. STEENLAND. I would like to add that the board, working on a regional basis would also help in this way: At the present time the Food and Drug Administration comes into play only when the material goes into interstate commerce. Now, if this board were set

up on a regional basis and every material recommended by an experiment station had to go through that board, then almost certainly no materials would be used within a State, even for within-State usage, that had not passed that board. So we would accomplish within our State what the Food and Drug Administration accomplishes in interstate trade.

Dr. MILLER. Of course, in these days of truck transportation it is pretty difficult to say that you will not get something in interstate trade when trucks can move in and take a load out overnight and be 500 miles away.

Mr. STEENLAND. That is true, but I have heard it all too often among people—I will not call names here, because of the situation that might be involved—well, this is only going to be used within Oregon; so, therefore, I am safe on it. Food and Drug can't test it. Now this recommendation would eliminate that situation.

Mr. JONES. I just have one question.

Do I gather from your statement that you think this regional board should make tests which would be a further safeguard that is not now being followed by your State experiment stations and by the manufacturers of these chemicals which are recommended for use?

Mr. STEENLAND. If necessary, yes.

Mr. JONES. Do you think they would go further?

Mr. STEENLAND. If they feel that the information submitted to them is not adequate, they would be authorized to require increased evidence, more evidence.

Mr. JONES. In other words, you are suggesting that we are not having enough precautionary measures taken at the present time in the use of these fungicides?

Mr. STEENLAND. In some cases, yes.

Mr. JONES. I have no further questions.

That is all. Thank you.

Mr. STEENLAND. May I make the statement that we are very happy for the privilege of presenting this evidence to you on behalf of the State of Oregon, department of pathology. We want to thank you for this opportunity.

Mr. JONES. We thank you for cooperating with us.

Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Dille.

(The oath was administered by the chairman.)

TESTIMONY OF J. M. DILLE, M. D., PH. D., PROFESSOR AND EXECUTIVE OFFICER, DEPARTMENT OF PHARMACOLOGY AND TOXICOLOGY, SCHOOL OF MEDICINE, UNIVERSITY OF WASHINGTON, SEATTLE, WASH.

Mr. KLEINFELD. Dr. Dille, will you read your statement, sir?

Dr. DILLE. I hold the doctor of philosophy degree with major work in pharmacology from Georgetown University and the doctor of medicine degree from the University of Illinois School of Medicine.

At the present time I am professor and executive officer of the department of pharmacology at the School of Medicine of the University of Washington. I hold membership in the American Society for Pharmacology, and Experimental Therapeutics, the Society for Ex

perimental Biology and Medicine, Sigma Xi, American Association for the Advancement of Science, and numerous other scientific associations and societies.

My research activities and interests have been centered in drugs which modify physiological function in an acute way. Examples of drugs on which I have done research are: The barbiturates, the analgesics, and the central nervous system stimulant agents. I have no direct experience with the agents which are commonly used either as insecticides or as food preservative. Therefore my information in this field has come from the reading of scientific publications and from discussions with workers who are interested in these problems. Nevertheless certain conclusions have developed in my thinking with respect to the usage of chemicals in food products.

The progress of our contemporary civilization has depended upon man's increasing ability to control the facts of his environment. This began when our primitive ancestors first intentionally cultivated the food-producing plants which he found valuable as foods and began domesticating animals for the same reason. He, likewise, made use of materials found in his environment for other purposes such as clothing, shelter, and utensils and tools.

It has only been in the last hundred years with the advent of modern chemistry that civilized man has reached a stage where he is able to go behind nature's offerings and out of his intellectual activity create new materials for his use. Chemists have created synthetic dyes which are improvements over those available from natural sources; they created new materials in the form of synthetic plastics and have been able to go so far in the creation of new drugs that plant sources have become, with few exceptions, practically obsolete so effective are the products of the chemical laboratory.

Such progress has been going on in the food technology industries. The growth of our civilization has made the need for better crop yields imperative and has led to the introduction of insecticides. Specialized farming which makes it necessary to ship crops to distant points has led to the introduction of methods for food preservation. One cannot help but feel pride in the way our scientists have developed solutions to these problems, and the way our industrialists have applied them.

Such progress is attended with hazard. This hazard lies predominantly in the obvious possibility that an insecticide or a food preservative may be ingested by the person who eats the food. There would seem to be no question but what it is within the province of a government to protect its citizens from a hazard such as this just as it sets up means of protecting citizens from invasion from without or from crimes of violence from within. How can this be done?

Undoubtedly new insecticides and food preservatives will originate in the chemical industry. Undoubtedly, too, such industry will carry on adequate investigations in order to determine the effectiveness of such a chemical for the purpose intended. I feel sure that most enlightened chemical industries of the present day will also investigate the potential dangers of such agents to humans when ingested with food.

Such investigations are not only motivated by humanitarian considerations but by the obvious commercial value of an effective insecticide or food preservative which would be absolutely without danger to

human beings. Against these motives is the possibility of a chemical industry, under the pressure of urgent need, putting them out for use before adequate investigations have been completed.

I feel that the burden of proof as to the safety of a chemical present in a food product should rest with the manufacturer. The manufacturer should however have clearly stated for his guidance the tests and information needed in order to evaluate the safety of such an agent. The role of government should be that of formulating the nature of such tests and of evaluating the results obtained from them.

I would suggest that the information collected by the company from tests made on the chemical might fall into the following categories:

1. The chemical and physical properties of the agent along with data on how it might be chemically changed under the conditions of use when in contact with the food or under conditions of moisture and temperature under which the foodstuffs might be transported.

2. A statement of the exact conditions under which the chemical is to be used, the purposes for which it is intended, and definite statements as to the minimal quantities permissible in the ingested food.

3. The pharmacological effects of the agents when administered in single doses to animals should be thoroughly described.

These should include not only the effects of the agent on the physiological functions but should include descriptions of any pathological changes in tissues which the agent might produce.

4. Information as to the manner in which the chemical is metabolized in the body, its route of excretion and the degradation products resulting from its metabolism.

5. The effect of administering the chemical in small quantities over long period of time.

This must be done in animals and it would be desirable to use at least two species, and if possible, to carry the administration of the agent over at least two generations of the species under study. These studies are of importance because chemicals present in foods are more likely to be a danger because of the ingestion of small quantities at more or less frequent intervals over a long period of time than the ingestion of large quantities in a single dose.

Wherever possible, such studies should simulate the conditions under which the chemical might be used for human consumption. This would mean that the animal would be fed not only the chemical but the food with which the chemical had been in contact.

6. It would be desirable to have information from studies on humans who have ingested the chemical in the same condition under which it might be used.

Such clinical studies should be directed toward the determination of not only the effect of the new chemical on healthy individuals but the possibility of the chemical being a hazard to individuals suffering from various disease conditions such as hypertension or diabetes. Consideration must also be given to the possibility of the agent acting as an allergen and sensitizing the person to future exposure to the chemical. Such a possibility might not necessarily eliminate the chemical from general use since such sensitization can be shown to develop to any known chemical substance. Only if the frequency of such manifestations is high should the use of chemicals be restricted.

Information such as this should be submitted to a Government agency with the petition of the manufacturer to place the chemical

for use under conditions specified, in food-industry channels. The evidence would be carefully reviewed by the agency, and if necessary consultants who have special knowledge in the various fields of chemistry, pharmacology, pathology, and chronic diseases should be asked to give an opinion as an aid to the Government agency in reaching its decision.

If approval is granted for the use of a chemical in food industry under conditions specified by the manufacturer such approval should be provisional and the Government should have means for a careful follow-up of the chemical for at least 2 years in order to take it out of use should unforeseen dangers develop.

In summary, the use of chemicals as insecticides or as preservatives in food products represents an important means to man for assuring himself of a better, more varied and more pleasant diet.

Such progress should be fostered and encouraged. The danger lies in the possibility that an effective insecticide or food preservative might prove to be inimical to the health of those who are the ultimate consumers of the food. The best way of forestalling such a possibility is by comprehensive studies of the effects of the agent beforehand.

Thank you.

Mr. JONES. Dr. Miller, do you have any questions?

Dr. MILLER. I have one or two.

I notice you are interested more in the acute physiological results and not the chronic. Where is the line of demarcation between acute poison and one that is chronic? What difference does it make?

Dr. DILLE. Usually we think of the acute effect of a drug as one which results from the administration of a single dose of the drug, and we think of chronic effects as the result of administration of a number of doses at intervals over a long period of time.

Dr. MILLER. Your subject deals with chemicals mostly in foods, and it seems to me we had some evidence in our testimony that hundreds of different chemicals are knocking at the door of the food industry for use, and some of them have not been properly tested as yet. That is quite a chore for somebody. If you are going to use any one of these chemicals in the food industry over a long period of time, it might be questionable as to what would happen.

I think we should say, though, in fairness to all these companies, most of them have been very careful about the determination of whether it was harmful. They have done much to advance science. There have been so many new things coming into the field it is just unbelievable, and, as you know, in the medical field there have also been tremendous advances. The use of chemicals which your statement deals with is certainly an important factor. You spoke about the position of Government in this thing. It has always bothered me just where Government should step in.

For instance, we have had bread hearings in Washington running over 7, 8, 9 years. It seems they are continuous, that the Government never makes a decision. They leave a lot of things hanging on the book. Maybe a board of some kind could make a decision, although I believe you agree with me that the burden of proof should be upon the manufacturer who wants to use a new chemical; he should be able to assemble and present the evidence to either the Food and Drug Administration, or to some board that will say, "Yes, this is all right," or, "It is not all right." And the Government should be in the posi-

tion of guaranteeing fair play between manufacturers and the public who, after all, must be called upon to consume some of these chemicals.

Dr. DILLE. Dr. Miller, from what I have seen of the activities of the Food and Drug Administration and from a sort of advantageous position as an interested outsider, I certainly agree with everything that you have said.

I think that a manufacturer has no difficulty in quite rapidly determining how effective a new chemical is as a preservative or as an insecticide or fungicide. The difficulty lies in determining its safety to humans who will ingest it along with the food.

Dr. MILLER. And when there is so much competition in industry, you will get some of those on the fringe who might want to use something because it is a little cheaper, creates an advantage in price, and so forth, that might not be good for the human being.

Dr. DILLE. That is true.

Dr. MILLER. Then someone has to be the umpire to guarantee that this thing is not used when it is detrimental.

Dr. DILLE. The field is highly competitive, and one of the potential dangers is that a manufacturer would jump the gun, so to speak, without adequate scientific evidence of safety.

Dr. MILLER. And, of course, you would be dealing with the chronic effects and not acute effects which your field covers?

Dr. DILLE. Yes. Those are the most difficult to study and to get adequate evidence.

Dr. MILLER. That is right.

Mr. JONES. Mr. Horan, do you have any questions?

Mr. HORAN. Just one question.

I think in this whole field we should distinguish between foods as such which come under the Food and Drug Act, and whose ingredients must be put on the label, and those consumer articles which are not covered by the Food and Drug Act whose ingredients do not have to be on the label. Of course, your recommendations would bring into purview the whole category of insecticides, which do have to have the very clearance that you recommended here through the Production and Marketing Administration, and you have not made this very clear in your testimony. We run into this thing in all of our considerations. What we are trying to do is to clear up a lot of misinformation and a lot of rumors that are going around now. We have got to deal with these things in human psychology. So the question before this committee is how can we best use the Dr. Dilles in our universities? And I assume that you belong to an association of pharmacologists?

Dr. DILLE. That is correct.

Mr. HORAN. There are dozens of them that have made their appearance before the committee. We have the Production and Marketing Administration dealing with these factors in their own field. We have the Food and Drug people doing an excellent job. And we have the Public Health Administration. I assume you know that they are becoming active now in the marine hospital here in Seattle?

Dr. DILLE. Yes.

Mr. HORAN. In trying to work on human beings to determine the effect of insecticides, because being an important producing and exporting State, that is vital to our producers out here, especially vital because we have so far to ship to market. I assume you know also that our reliable and responsible insecticide and chemical producers

have their association, they have their research departments. Our job is to find some common ground where we can bring good minds together and assure both the producer and the consumer of consumer goods, food, cosmetics and anything else that might affect the public health, if it comes under the purview of this select committee. Our work is not sensational but I think it is fundamental, and I think you do, also. Did you take that into consideration when you prepared this statement—all of what I have mentioned—or only the pharmacological angle?

Dr. DILLE. Well, I am perhaps the victim of a highly specialized background. As a matter of fact, I was not certain why the committee asked me to appear.

Mr. HORAN. I am glad they did because your testimony is good as far as it goes.

Dr. DILLE. I am well aware of the points you mention.

Mr. HORAN. That is the point we are after—to bring into focus all of the factors that can protect the people in the United States. We have no other purpose. And to place in the limelight those who may jump the gun as you mentioned earlier in replying to Dr. Miller's question, and who might present to the consuming public something that was not clear or that was deleterious to the public health. There might be synthetics used in the creation that might cause in some people allergies and that sort of thing.

Dr. DILLE. Surely.

Mr. HORAN. Which should be checked, of course, by the people who know something about it. That is all I wanted to say to Dr. Dille. I appreciate your testimony and I was not being critical. If it appeared so I want you to forgive me.

Mr. JONES. Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Dille, are you familiar with the fact that the Public Health Service is conducting studies on the toxicity of DDT?

Dr. DILLE. I have heard only indirectly about it.

Mr. KLEINFELD. Well, just this morning we got from Washington, D. C., a pamphlet put out by the Technical Development Services, Communicable Disease Center, United States Public Health Service at Savannah, Ga., dated February 27, 1950, on DDT.

Here are some of the statements that the Clinical Memorandum—that is the title of it—makes:

> DDT is probably the most widely used insecticide now available. * * * DDT is readily absorbed from the intestinal tract and if it occurs in the air in the form of an aerosol or dust, it may be taken into alveoli of the lung and readily absorbed. * * *
>
> DDT acts on the central nervous system, but the exact mechanism of this action either in man or in animals has not been elucidated.

And then they say this:

> DANGEROUS CHRONIC DOSE IN MAN
>
> Even less is known of the hazard of chronic DDT poisoning. It is known that experimental animals fed diets containing five or even fewer parts of DDT per million store the compound in their fat. It is also known that operators who spray or formulate DDT encounter enough of the material to store it in their body fat. The exact significance of this finding is not known and its further investigation is of the greatest importance.

In line with your statement before this committee, do you believe that any substance, any product, should be widely used in a food pro-

duct before all the information which this clinical memorandum discusses is available?

Dr. DILLE. The ideal situation would be to have all this information before it was used as DDT is now used. Practically, I do not know whether that can be achieved. One would have to weigh the relative advantages and disadvantages.

DDT was introduced during the war for the control of disease-carrying insect vectors, and I think there that the advantages of using it far outweighed the possibilities of this chronic poisoning. I think that certainly we should have all the information we can get within practical limitations before a drug is used.

Mr. KLEINFELD. Do you see a difference between using a product such as DDT to control some scourge such as malaria, and using it in or on a food product which is going to be widely consumed? Is there a practical difference in your opinion as a pharmacologist?

Dr. DILLE. I think there might well be. One could, say, spray with the DDT and control the insects which would be the disease transmitters, and do that maybe twice during the season. But if the DDT were sprayed on in this way the possibility would then exist that the consumer who ate an apple a day would be getting DDT every day during the year. And in view of the statement you just read of its accumulation, there would be a possibility of poisoning from that accumulation.

Mr. HORAN. Might I interpolate there. Of course, we are aware from our observations in Wenatchee that that is the vital thing that counsel has presented here. Thanks to the work of Clarence Cannon, of Missouri, chairman of the House Appropriations Committee, and Senator Russell, of Georgia, of the Senate Agriculture Appropriations Committee we have a laboratory in Wenatchee, and we are going after those very factors, as you are aware. Unfortunately there was a headline in my local paper in Wenatchee which indicated that the Public Health Service was not afraid of DDT in any particular. That is not true. They did go so far as to say they were not afraid of the effects of DDT in the consumer articles shipped out of one of our shipping points here in the State of Washington if it was properly handled, because they were able to make that statement now. However, they are not sure, they do no know yet, and we are in the process of determining what continued or excessive exposure to any chemical, including DDT, might be. Along that line, 71 samples of fatty tissue, as I understand, have gone from the State of Washington to Savannah, Ga., for examination and more will follow. They are part of, I believe, in excess of 200—is it not, Mr. Kleinfeld?

Mr. KLEINFELD. I did not think there were that many. I am not sure.

Mr. HORAN. It was 150, I know, of similar samples that are in Savannah now.

What we are trying to do is to get a factual basis upon which to determine that which is deleterious to the public health. Already they are willing to assert that the practices in the use of insecticides of that nature in this state are not deleterious to the public health. But that is not the answer we want, nor the one that you want as a scientist and pharmacologist. You want to know exactly what the situation is, is not that true?

Dr. DILLE. Well, I might help you by quoting from a recent book called Fundamentals of Pharmacology by Dr. Marsh, of West Virginia.

He says, "The difference between a drug and a poison is only the point of view." And here we have a substance like DDT, which serves a useful purpose in our economic life, and ultimately it is ingested in small quantities.

Now that may not be harmful at all to the individual, and yet DDT could produce all these cerebral disturbances if the dose were large enough. So the problem of usefulness as opposed to danger is in the point of view and related to the amount.

I might give another example. We have all heard of the terrific dangers of radiation and protection measures which must be taken around plants like the Hanford plant, and yet right here in this room we are all subjected to the radiation of cosmic rays, which, as far as I can learn from my physicist friends, are basically identical to those produced by plutonium and uranium. So it is a matter of relativity.

Dr. MILLER. Dr. Dille, would you say flatfootedly that DDT is not harmful to humans?

Dr. DILLE. I would have to qualify that and I tried to do this in the statement I made, where I introduced the phrase "safe under conditions prescribed," or "safe when used as directed." That I think is the crux of the matter. In your testimony from previous witnesses you have had some very flamboyant accusations against DDT and I think again it is the point of view. DDT, I would hope, would be perfectly safe if the conditions were not exceeded, because it is a remarkably effective insecticide.

Dr. MILLER. You think a little poison might be a good thing then for us once in a while?

Dr. DILLE. I would not say a "good thing," but it might be innocuous.

Dr. MILLER. What are you saying?

Dr. DILLE. I would say a little poison is something the average human being might be able to get away with.

Mr. HORAN. May I ask you if you do not prescribe strychnine at certain times for certain people?

Dr. DILLE. That again is only a point of view. Yes, indeed.

Dr. MILLER. It is prescribed for a definite reason, a disease, but I don't know of any disease DDT is supposed to cure in a human being. If you do, it is a new one to me.

Mr. JONES. I think that we are getting into a discussion on which we could go on and on.

Is there any other question on the statement?

Mr. KLEINFELD. I have one other.

Mr. JONES. All right.

Mr. KLEINFELD. Doctor, are you familiar with the use in a large variety of foods of surface-active agents such as the mono- and diglycerides and polyoxyethylene monostearate?

Dr. DILLE. I could not speak with any real knowledge on that.

Mr. KLEINFELD. Are you familiar with the food protection committee of the National Research Council?

Dr. DILLE. I have heard of it, mainly through the testimony.

Mr. KLEINFELD. Then you are not familiar with the reports made by that food protection committee about 6 months ago on the use of various surface-active agents?

Dr. DILLE. No.

Mr. KLEINFELD. What they concluded in that report is that, after making an exhaustive investigation into all available data on the surface active agents used in a large variety of foods, like bread and cake and others——

Dr. DILLE. Yes.

Mr. KLEINFELD. They could not reach a conclusion as to whether or not the various surface-active agents, both types of them, were or were not safe.

If that conclusion came to you as a pharmacologist, would you say that such products should or should not be used in a large variety of foods?

Dr. DILLE. My first reaction would be a conservative one.

Mr. KLEINFELD. To wit?

Dr. DILLE. I would say if they can't make up their minds in view of the present facts available, we should not permit its use until more facts can be uncovered.

Mr. KLEINFELD. I have no further questions.

Mr. JONES. All right.

Thank you very much, Dr. Dille.

Dr. DILLE. Thank you.

Mr. JONES. Who is the next witness, please?

Mr. KLEINFELD. Dr. Sealey.

(The oath was administered by the chairman.)

Mr. JONES. Be seated, please. Would you like to read your statement?

Dr. SEALEY. I would.

Mr. JONES. All right, sir, you may proceed.

TESTIMONY OF J. LEON SEALEY, M. D., ENVIRONMENTAL RESEARCH LABORATORY, UNIVERSITY OF WASHINGTON, SEATTLE, WASH.

Dr. SEALEY. I hold the degrees of B. S., in chemical engineering and M. S. in biochemistry from Kansas State College, and M. D. from the University of Kansas.

I am now special medical consultant to the Environmental Research Laboratory, University of Washington; special consultant to the United States Public Health Service, CDC Division, Toxicology Laboratory, Wenatchee, Wash.

I am licensed to practice medicine in Washington, Oregon and Kansas, and hold or have held membership in the Washington State Medical Association, King County Medical Society, American Chemical Society, Association for the Study of Internal Secretions, and various other professional associations. I am a member of the committee on toxicity of insecticides of the Washington State Horticultural Association.

My research and professional experience has included 7 years in the pharmaceutical industry directing research on the activity and toxicity of new drugs before they were released for clinical trial. I have published several scientific papers as a result of this work.

For 2 years before coming to the University of Washington I practiced industrial medicine.

Since its organization at the university in January 1951, the Environmental Research Laboratory has received grants and fees for service from plants, industries, communities, and governmental agencies for the study of industrial environmental health hazards. Our research during the past year has been on agricultural chemicals, atmospheric pollution, and industrial hygiene.

It has included: A study of reported illness from environmental exposure to organic phosphates in eastern Washington, 1950. A study of reported dermatitis among packers and sorters of apples from exposure to organic phosphates in eastern Washington, 1950. A study of atmospheric pollution for the city of Seattle. A study of the action of organic phosphates on persons living in the vicinity or working in apple orchards in the upper Columbia River Valley, 1951. A study of the health hazards associated with rocket fuels and exhaust to persons in areas where rocket motors are in operation. This is a contract with the United States Air Matériel Command. A study of various in-plant industrial hygiene problems.

Since May 1951 we have been studying health hazards of organic phosphate application in the Columbia Valley north of Chelan, Wash. Each orchard was isolated by distance and topography from any other so that our results have not been confused by mixed organic phosphates. Four members of our staff spent more than half their time and 5 graduate students spent full time this past summer making medical, field, and laboratory studies of more than 175 persons. Results of more than 2,000 cholinesterase determinations support the following conclusions:

1. All actual illness from organic phosphate has resulted from carelessness or ignorant handling of these chemicals.

2. Plasma cholinesterase determinations are reliable indicators of minimal organic phosphate absorption.

3. Erythrocyte cholinesterase determinations are reliable indicators of serious organic phosphate absorption and acute intoxication.

4. The plasma cholinesterase is generally below 50 percent of normal before any signs or symptoms of organic phosphate absorption are detectable.

5. The erythrocyte cholinesterase is generally below 20 percent of normal in serious organic phosphate intoxication.

6. Most persons reporting "spray illness" to their family physicians have had no significant lowering of plasma cholinesterase.

Reliable scientific studies of others have repeatedly shown that the residues of organic phosphate remaining on fruit at the time of harvest are insignificant when compared to the exposure we know an average orchard worker or resident of the neighborhood experiences during the spraying season. But if you ask me, "Do organic phosphate residues on fruits have any effect on the consumer?" I cannot give you an answer.

I believe that scientific studies of persons consuming fruits treated with anticholinesterase chemicals could easily answer this question. Such a study should not be made in the vicinity of orchards where organic phosphate insecticides are used.

Mr. JONES. Thank you.

Dr. Miller, do you have any questions?

Dr. MILLER. I thought this statement rather unusual: "But if you ask me, 'Do organic phosphate residues on fruits have any effect on the consumers,' I cannot give you an answer."

Dr. SEALEY. That is right.

Dr. MILLER. In other words, you have not gone into that field?

Dr. SEALEY. That is right. That would require further study.

Dr. MILLER. How long has it been under study?

Dr. SEALEY. Pardon me?

Dr. MILLER. How long has it been under study?

Dr. SEALEY. As far as our study is concerned, this past summer has been the only intensive study.

Dr. MILLER. Has it been under study by other groups?

Dr. SEALEY. There has been some study, the point being that the development of this cholinesterase test, which is a test for this enzyme in the circulation has not been sufficiently developed to allow too much evaluation up to this time. And I feel——

Dr. MILLER. And organic phosphates are being used as sprays upon fruit and so forth.

Dr. SEALEY. That is right.

Dr. MILLER. Do you think the burden of proof should be upon the manufacturer as to whether they are toxic before they are permitted to be used?

Dr. SEALEY. There is no doubt about their toxicity. The evidence, and quite well-documented evidence, is that relatively no significant residues remain at the time of harvest or marketing.

Dr. MILLER. But it hasn't been definitely determined, you say in your statement here—you don't know.

Dr. SEALEY. I would say it is only speculation on my part that you could even detect harmful amounts. Organic phosphates are among what we would call the extremely acutely toxic chemicals, and one could pretty well presume that chronic effects would not come into the picture because there are only traces at best.

Dr. MILLER. I think that is all.

Mr. JONES. Mr. Horan, do you have any questions?

Mr. HORAN. Well, now, look. If these phosphates, according to your deductions here, don't harm the people who apply them——

Dr. SEALEY. Pardon me. I want to make myself clear—apply them under reasonably careful and not careless conditions.

Mr. HORAN. I do not care how. I am just quoting from your deductions you have made here, which are very good.

I think this is an unusual statement—a very good one, too. I am very happy that the University of Washington in setting up their outstanding School of Medicine here, has employed you, Dr. Sealey. I want to congratulate them. And this is a good statement. You have made an exhaustive study of better than 2,000 cases according to your testimony?

Dr. SEALEY. No; 175.

Mr. HORAN. You say, "Results of more than 2,000 cholinesterase determinations"——

Dr. SEALEY. 2,000 determinations.

Mr. HORAN. You mean 2,000 determinations.

Dr. SEALEY. Because we were running determinations on these fellows, many of them, oftener than weekly intervals.

Mr. HORAN. 175 persons and 2,000 determinations.

Dr. SEALEY. Right.

Mr. HORAN. That, in itself, reaches the field where scientific deductions are permitted; isn't that right?

Dr. SEALEY. Well, it is a good beginning, I believe.

Mr. HORAN. If you get around 2,000, even a scientist might make a definite statement.

Dr. SEALEY. A respectable conclusion.

Mr. HORAN. And you have made a statement here regarding the effect of these chemicals on those who apply them.

Dr. SEALEY. That is right.

Mr. HORAN. Now that which is applied on the edible fruit is taken off of that on which it is produced, namely, the tree, and run through a wash and dried and wiped, and then it is packed and sent to the consumer.

I don't know whether you will answer this yes or no, but I am going to ask you this question: Is it reasonable to assume that the consumer might be safe in using that product?

Dr. SEALEY. I think I would use it myself, or my family, without any fear whatsoever.

Mr. HORAN. That is all I wanted to know. Thank you.

Now the other idea brought up here is the burden of proof on the producer of chemicals. We cannot produce fruits or vegetables or other foodstuffs that the consuming public of America needs without them. We cannot produce these things without the use of chemicals. Therefore the producers have a place in this picture.

Now how is the producer of a chemical going to prove that things are not deleterious if their produce is used on a growing crop? How is he going to prove that that product is not deleterious to the public health after it is applied without outside help from pharmacological institutions from our universities or from the Public Health Service?

How are we going to license a chemical manufacturer to go into the whole field of guinea pig or human volunteer investigations to prove that if his product is used it would not hurt the public health? Isn't that a place where we have to bring into purview the whole field of those capable of arriving at those determinations?

Dr. SEALEY. I entirely agree. I think Dr. Kehoe mentioned before this committee that perhaps our human cases still represent the best guinea pigs in the final analysis.

Mr. HORAN. Well, we have volunteers in this State, you know, from pretty high levels of our society. In fact, I am one who is willing to volunteer if necessary.

Dr. SEALEY. If you live in eastern Washington I am sure you already have.

Mr. HORAN. I am sure of that. In 1940 some of our better citizens volunteered. That is all I have.

Mr. JONES. Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Sealey, just for the sake of the record, would you mind defining cholinesterase and indicating what it amounts to and what it shows?

Dr. SEALEY. Yes. Cholinesterase is an enzyme that we all have in our circulation. Its function is to destroy acetyl choline, which is formed every time there is a nerve impulse. We have a minute amount

of acetyl choline formed; and, if it isn't destroyed quite rapidly, we literally become intoxicated by our own production of chemicals.

Dr. MILLER. At that point, will you tell us the results on the white or red blood corpuscles if they are not destroyed?

Dr. SEALEY. As far as I know, there is no effect on the white or red corpuscles. However, there is the enzyme that we determine in the plasma. I think perhaps that is what you refer to.

As far as the organic phosphates with which we are familiar are concerned, the enzyme is irreversibly destroyed. Shall we say, you have about 10 times the amount of enzyme ordinarily needed. When you get down to less than 20 percent of normal, you are certainly in danger of becoming ill.

Dr. MILLER. In the use of this phosphate chemical, you have not found there have been any blood changes in the erythrocytes or white blood cells, mononuclear or polynuclear cells?

Dr. SEALEY. As far as the cells are concerned, I could not answer. We were studying strictly the enzymes.

Dr. MILLER. It didn't increase the number of neutriphils as far as you know?

Dr. SEALEY. We didn't even study it; so, I cannot answer that question.

Dr. MILLER. I saw a scientific article not too long ago on not only phosphatic but other chemicals of a similar nature, and they seemed to feel that over a period of time the people involved in the use of them, in dusting and so forth, had some breakdown in particularly the white blood corpuscles, the mononuclears and your eosinophils.

I wondered whether your studies had gone into that particular field. I believe, however, it was eliminated very soon after their withdrawal from the contact.

Dr. SEALEY. Certainly the enzyme, particularly that in the plasma, jumps back up, approaches normal quite rapidly.

Dr. MILLER. Yes.

Dr. SEALEY. The red-cell reduction is a little slower in recovery.

Dr. MILLER. Thank you very much.

Mr. JONES. Any other questions, Mr. Kleinfeld?

Mr. KLEINFELD. No.

Dr. SEALEY. I might add, you mentioned—maybe on or off the record—about DDT never being prescribed. It is a pretty good scabicide.

Dr. MILLER. For fruit?

Dr. SEALEY. No; this is for scabies.

Dr. MILLER. To kill scabies in humans?

Dr. SEALEY. Oh, yes, and it is used quite a bit for that.

Mr. JONES. Thank you very much, Doctor.

Dr. SEALEY. Thank you.

Dr. JONES. Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Powers.

(The oath was administered by the chairman.)

Mr. JONES. Would you like to read your statement?

Dr. POWERS. Yes, sir.

TESTIMONY OF L. E. POWERS, M. D., PROFESSOR AND EXECUTIVE OFFICER, DEPARTMENT OF PUBLIC HEALTH AND PREVENTIVE MEDICINE, SCHOOL OF MEDICINE, UNIVERSITY OF WASHINGTON, SEATTLE, WASH.

Dr. POWERS. I hold the doctor of medicine degree from the University of Iowa and the master of science in public health degree from the University of Michigan. At the present time, I am professor and executive officer of the department of public health and preventive medicine at the University of Washington School of Medicine. I am a member of the American Medical Association, American Public Health Association, and other professional organizations.

My main interest prior to joining the teaching staff of the University of Washington has been in the field of public-health administration. Since 1935, I have been a health officer of a county health department, commissioner of health of Tacoma, Wash., director of health of the Washington State Health Department, active duty with the United States Public Health Service Reserve, and chief medical officer of the China Office of the United Nations Relief and Rehabilitation Administration.

My direct experience with harmful substances added to foods in their preparation or processing and chemicals used as insecticides on natural foods has been limited. As a public-health official in the past, legally responsible for the protection of the public's health, it was necessary to initiate action against violators of local food ordinances. The burden of proof, of course, was our responsibility to first establish the fact that a foreign substance had been added; and, second, to prove that in the amounts present the substance was dangerous to the consumer.

The present Federal Food, Drug and Cosmetics Act places the Administrator of the FDA in the same position in the control of foods and food products distributed in interstate commerce. This procedure, in my opinion, is too slow to protect the consumer. In actual practice, the elimination of dangerous food additives does not usually occur until after many persons are affected.

Dr. Leonard H. Scheele, Surgeon General of the United States Public Health Service, has presented to this committee an excellent review of the importance to public health of the present rapid developments and expansion in the use of chemicals in the development of food supplies and in the preparation and processing of foods.

The time involved, the costs, and the complicating factors which are present in any program of pretesting chemicals to be used in or on foods for their chronic effects have been presented by the many experts appearing before the committee.

With due consideration for the above factors and for the urgent needs for the rapid expansion in food production, it is my conviction that present Federal legislation pertaining to foods and insecticides should be modified to more adequately protect the consumer. It is my belief that any modification or amendment proposed should include:

1. A requirement that all chemicals to be used on or in foods be subjected to studies of acute and chronic effects prior to their use.
2. The required investigations and tests for determining the acute

and chronic effects of the proposed chemical to be defined by a neutral board, council, or existing Federal agency; i. e., USPH. The services of such a board, council, or agency should also be available on a consultative basis to both the administrators of the Federal Food and Insecticide Acts and to the manufacturer of the chemical or processor using the chemical.

3. The manufacturer of the chemical should be responsible for the required tests and studies. Facilities and staff for necessary checking of the manufacturer's results should also be provided in the Federal enforcing agencies.

4. Final interpretation of test results and the establishment of maximal allowable limits of concentration of the chemicals should be set by the neutral expert board, council, or agency mentioned above.

5. Chemicals currently in use which have not adequately been studied, as determined by the expert board, council, or agency, should be given a temporary or provisional approval pending adequate study within a definite time period set by the expert body.

6. Provisions should be made for the adequate control of chemicals or biologicals which appear in foods after treatment of animals, fruits, grains, and vegetables, such as penicillin used in the treatment of mastitis in milk cows.

7. Provision for appeal by the individual or company first to the expert body and then to the courts.

Thank you.

Mr. JONES. Do you have any questions, Mr. Horan?

Mr. HORAN. I think that is an excellent statement, and I am inclined to agree with it right down the line. I think that is exactly what we need.

I have been advised, though, that some of our antibiotics should not be used indiscriminately. But I understand that it is possible to get aureomycin without a doctor's prescription.

Dr. POWERS. That is right, in some States.

Mr. HORAN. Is that good?

Dr. POWERS. I think that is probably right at the moment.

Mr. HORAN. It fits right in with your testimony—at the moment. I have been advised, because I was interested for myself, that I should not under any circumstances use that without a doctor's prescription, and I have been abiding by that information.

Dr. POWERS. I think you are wise.

Mr. HORAN. That fits in with your testimony, also.

So, Mr. Chairman, I have no further questions to ask. I think his statement is right in line with what we are trying to determine. I commend you on this statement. I just wanted to bring out that aureomycin is being sold to the public now, and there is an outside possibility that it might cause difficulties if that person has pneumonia after having used it once. Is that correct?

Dr. POWERS. I don't know that I can answer that.

Mr. HORAN. You don't know. That fits in with your testimony, also. So, we should find out; should we not?

Dr. POWERS. That is right.

Mr. HORAN. That is correct?

Dr. POWERS. Yes.

Dr. MILLER. I have a couple of questions.

Mr. JONES. Dr. Miller.

Dr. MILLER. You say you were a public-health official. You speak about the action against violators of local food ordinances. The city here, I suppose, and other cities have food ordinances which those who sell fruits and vegetables must follow—certain standards to which they must conform.

Dr. POWERS. That is right.

Dr. MILLER. And do you know whether the public-health officials check very carefully the conditions of stands from which these foods are sold as to cleanliness?

Mr. POWERS. They do to the limit of the staff and their ability.

Dr. MILLER. You speak also about the Food and Drug Administration and their officials being entirely too slow in making determinations.

Dr. POWERS. Well, I would not say they are too slow, but the way the law is written they have to prove the case before they can take action, which I think allows too much danger to the consuming public.

Dr. MILLER. And you would agree that, generally speaking, the individual who is going to use either a new chemical in food or a new insecticide, or even a fertilizer, should present some proof to a proper agency as to its efficiency, as to whether it is poisonous and so forth?

Dr. POWERS. That is right. And I think that the enforcing agency should not have that full responsibility. I think it should be another body.

Dr. MILLER. There should be another agency perhaps that should determine some of it?

Dr. POWERS. That is right.

Dr. MILLER. I would agree with you on that. Of course, the time element is rather important. I think it is quite the practice now to go ahead and use a chemical in food, or an insecticide, then wait for its approval later on.

Dr. POWERS. Well, I think that could still be determined by the expert board which would have the scientific knowledge that is necessary to allow a tentative approval until further tests might be done. I mean it is relatively easy to determine whether it is going to be acute or whether it is accumulative without too much evidence, and they could base their scientific decision on whether they are going to allow it to continue until further tests are done.

Dr. MILLER. Of course, DDT came into existence in 1942, or perhaps it was known long before that. But during the war it had its big increase in use.

In 1945 the use of DDT was pretty general in dairy barns, in the killing of flies and insects and so forth. Then they decided that DDT did show up in milk and fat and butter, and some question about its being used was raised. Have you had any experience with DDT?

Dr. POWERS. No.

Dr. MILLER. Do you know what the law is in Washington or Oregon relative to the use of DDT around dairy barns?

Dr. POWERS. No; I do not.

Dr. MILLER. Do you know what the United States Public Health Service recommends relative to the use of DDT around dairy barns?

Dr. POWERS. I understand they recently recommended it not be used around milk cows.

Dr. MILLER. I think that is correct.

Dr. POWERS. I think so.

Dr. MILLER. That is all I have.

Mr. JONES. Mr. Kleinfeld?

Mr. KLEINFELD. For the sake of the record, am I correct in that you stated that aureomycin could not be obtained without a prescription?

Dr. POWERS. Of course; that is right. I think the Federal law permits until April 1——

Mr. KLEINFELD. Doctor, under existing Federal law, you cannot get antibiotics without a doctor's prescription.

Dr. POWERS. It depends on the State board of pharmacy.

Mr. KLEINFELD. Under Federal law you cannot get the antibiotics without prescription.

Dr. POWERS. I am not familiar with Federal law.

Mr. KLEINFELD. In trying to determine, Doctor, whether any particular product has or has not some toxic quality, you use animals in experimental work, do you not?

Dr. POWERS. Not being a toxicologist, but knowing somewhat from my reading, of course animals must be used.

Mr. KLEINFELD. Do you believe that the results of such experimental work are helpful in determining the possible harmful effects of any substance?

Dr. POWERS. On that animal; yes.

Mr. KLEINFELD. Are they helpful at all, in your opinion, in translating the results into the possible effects on human beings?

Mr. POWERS. They are helpful, not final.

Mr. KLEINFELD. They are of some help in determining it?

Dr. POWERS. That is right.

Mr. KLEINFELD. In other words, if you do not have human guinea pigs you do the next best thing?

Dr. POWERS. That is right. You usually do not use human guinea pigs until after you use animal guinea pigs.

Mr. KLEINFELD. I have no further questions.

Mr. JONES. Thank you, Doctor.

Dr. POWERS. Thank you.

Mr. JONES. Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Mr. Shaw.

(The oath was administered by the chairman.)

Mr. KLEINFELD. We just received Mr. Shaw's statement this morning. However, the committee might be able to read it while he reads it.

Will you please read your statement?

TESTIMONY OF WILLIAM H. SHAW, SUPERVISOR OF HORTICULTURE, STATE DEPARTMENT OF AGRICULTURE, OLYMPIA, WASH.

Mr. SHAW. My name is William H. Shaw and my address is 616 Seneca Street, Seattle, Wash. I am supervisor of horticulture of the Washington State Department of Agriculture. I have been employed by the department of agriculture for the past 27 years.

Sometimes it becomes necessary that my division assist in the regulation and enforcement of spraying and dusting with insecticides and herbicides. During the 1950 growing season, due to the use of new

organic phosphate insecticides, such as parathion, and so forth, being applied in dust form by aircraft, the director of agriculture received many reports that workers in orchards, as well as the innocent bystander, had become ill from the effects of these poisons and in some cases were hospitalized.

Doctors claimed this illness was due to the poisons being used carelessly in our commercial orchards and hop fields. Upon receiving these reports, the industry requested that the director immediately issue an order prohibiting the use of these organic phosphate insecticides, which he did on the 29th day of August 1950, the order reading as follows:

Order No. 584, effective August 29, 1950. An order relating to immediate suspension of all application of organic phosphates in dust form by aircraft.

I, Sverre N. Omdahl, Director of Agriculture of the State of Washington, by virtue of the authority vested in me by chapter 120, Laws of 1924, and section 2, chapter 150, Laws of 1943, do hereby find it necessary to order the immediate suspension of all application of organic phosphates in dust form in the State of Washington by aircraft pending further investigation.

Dr. MILLER. Mr. Chairman, will the gentleman yield at that point?

Mr. SHAW. Yes.

Dr. MILLER. I am trying to see whether the aircraft end was changed. Now what would prevent under that order a grower going out in the orchard and using a spray or power spreader or hand sprayer, or whatever he wants to put the parathion on the fruit?

Mr. SHAW. It seemed like——

Dr. MILLER. They prohibit here, not the use of parathion but the use of parathion by a certain method.

Mr. SHAW. That is right, and that method was causing the complaints that we were receiving.

Dr. MILLER. Then did the grower go on out and use it by power sprayer or some other method?

Mr. SHAW. You did not get the drift. These airplanes would carelessly go down over the orchards and sometimes have a little parathion left in their tanks; on the way home they would open up the valves and let it go some place.

Dr. MILLER. You have not answered my question. Would this permit the grower to go out with a power sprayer of his own and use parathion?

Mr. SHAW. Yes; that is right.

Dr. MILLER. And did they do it?

Mr. SHAW. Yes, they did.

Mr. JONES. Is that all, Doctor?

Dr. MILLER. Yes.

Mr. JONES. Proceed.

Mr. SHAW. After this order was issued and became effective, it became apparent that the heavy mite infestation in the orchards would damage the apple crop considerably, and the director, upon receiving this information, amended this order No. 584, and issued the following order:

Order No. 585. Effective August 31, 1950. Amending order No. 584 to permit the application of organic phosphates in dust form by aircraft in isolated areas only under the direction and supervision of the department of agriculture

I, Sverre N. Omdahl, Director of Agriculture of the State of Washington, by virtue of the authority vested in me by chapter 120, laws of 1945, and section 2, chapter 150, laws of 1943, do hereby amend order No. 584, which immediately

suspended all application of organic phosphates in dust form in the State of Washington by aircraft pending further investigation, to permit the application of organic phosphates in dust form by aircraft in isolated areas only under the direction and supervision of the department of agriculture.

Then it goes on there again. I will state now this is where the horticultural division furnished the men to supervise the dusting by aircraft during the remainder of the 1950 dusting program. The results were very satisfactory to our department, and all of the applicators cooperated in every way possible.

Since these two orders were issued, the last session of the legislature amended section 2787–31 of Remington's Revised Statutes, giving the director of agriculture more power to regulate the control of insecticides and herbicides.

During the 1951 dusting season, very few complaints of illness from the use of organic phosphate insecticides have come to our attention. This, I believe, is due to the present regulations and laws that we now have, and the splendid cooperation given by the United States Public Health Service, the Washington State Department of Health, the University of Washington, and the State College of Washington.

Thank you.

Mr. JONES. Dr. Miller, do you have any questions?

Dr. MILLER. I have one question.

Do you know what method is used, and how efficient it is, to remove the residue of parathion from fruit after it has been dusted?

Mr. SHAW. I do not.

Dr. MILLER. Very well.

Mr. JONES. Any questions, Mr. Horan?

Mr. HORAN. In order that the record may be complete, Public Health has stated that after 30 days it is their considered opinion—now this is subject to correction by anyone from Public Health—it is their considered opinion that there is no deleterious residue from parathion left on any produce that may be exposed to it.

Mr. SHAW. That is correct.

Mr. HORAN. Now I want to commend the Department of Agriculture of the State of Washington for the way they have cooperated with the procedures in this State and the way that you have attempted to bring in all of the people who could have a contingent responsibility in any situation affecting the production of produce in this country.

Now I had called on the Civil Aeronautics Administration when reports came to me that drift from an airplane had caused illness in the Birchmont area of Washington. So you have not only had the ones you have mentioned but you have had additional Federal agencies who are interested in these things.

If we are going to get any place in bringing the responsible phases of our society together, we have to have those in public office who can see beyond their own back yard, and apparently you have done that. In this case I think Sverre Omdahl, State Director of Agriculture, has moved with decision and has moved promptly, and I think we have made some progress.

Now you are aware, of course, and you did not elucidate there, that the Public Health Service has conducted extensive experiments with airplanes and colored dust on snow fields around Leavenworth to determine the peculiarities of the drift of dust from a spraying airplane. Is that not true?

Mr. SHAW. Yes.

Mr. HORAN. Have you anything further to add?

Mr. SHAW. I am not acquainted with that.

Mr. HORAN. I am sure that is so, because they are trying to find out what are safe flying conditions for the application of various dusts and, of course, to relate those to the time when dusts or insecticides should be applied to be effective on the insects or the pests that they might want to control.

That is a matter of record, and that has not been very well presented to the committee. Even while we were out at the laboratory they did not enlarge on that very much. But that has been done, I am sure of that.

Mr. SHAW. I see.

Mr. JONES. Mr. Kleinfeld.

Mr. KLEINFELD. What kind of complaints are you still getting with respect to the spraying of organic phosphates?

Mr. SHAW. We get a few complaints, and mostly they are from people who have been working with these organic phosphates for quite some time, and should know better.

I might just mention one case where one of our own men who worked for us—he was our economic poison inspector—was out taking samples of economic poisions to send in to be tested to see that they correspond to the label as marked, and he took some samples of parathion. When we started him to work he was given a mask and rubber gloves, and scoop to take this organic phosphate out of the containers, but he got careless and finally left the mask off and finally left the scoop in the car and used his hands. Well, he was in the hospital for three weeks. Those are the people who get hurt. It is the fellows who do not know any better that you think would get hurt, but that is not the case. It is generally the fellow who knows. He walks right into it.

I was in Wenatchee yesterday and a fellow was telling me about his foreman. He said, "You know, my regular crew that does the spraying never have any complaints, but," he said, "my foreman got sick last year."

I said, "How did that happen?"

The foreman was there.

"Were you around while they were spraying?"

"No; I walked in to see whether they were doing a good job."

I said, "That is the reason you got sick."

Those are the complaints we get.

Mr. KLEINFELD. Are you getting any complaints now about drifts from airplane spraying?

Mr. SHAW. No; we are not. Last year we got just an awful lot of them continuously, but the applicators now have their own organization and seem to police their own work. Because they know, if they don't put on the spray thoroughly, and if they cause a drift and they get complaints, why, regulations will be put through by our State Legislature the following year and just put them out of business. It almost put them out last year. So they have a wonderful organization and they seem to be taking care of their own.

Dr. MILLER. Are the people notified, the residents near an orchard, that they are going to spray maybe at 3 o'clock in the afternoon with parathion so they can either close the windows or get the kids out

of the orchard, so they can protect themselves? Is that a part of the regulations?

Mr. SHAW. According to our regulations that is necessary.

Dr. MILLER. To notify them?

Mr. SHAW. Yes, sir.

Dr. MILLER. Suppose someone objects. Maybe a woman is having a party in her house and does not want to close the windows? What then?

Mr. SHAW. I can't answer that. We have never had that case. I imagine it would create quite a problem, and I do not know how we would handle it. I think the director has the power if a certain area has to be sprayed, he can have that person removed.

Dr. MILLER. Do you know the extent of the drift in the ordinary airplane operation?

Mr. SHAW. No; I do not. I am not an authority.

Mr. HORAN. If I might interject, I think that is a subject we should have inquired of the Public Health Service when in Wenatchee, and we failed to do so. I suggest if we have qualified witnesses here that we question them regarding the findings that they made last winter. I wonder if Dr. Sealey could supply any information.

Dr. SEALEY. I think perhaps I could answer that. We did not go into the details and testimony regarding the drift, but we certainly had great evidence that, as far as TEPP is concerned, on the basis of cholinesterase, they are effective on the persons living in the area, at least a half a mile away. That was the summer study. But these persons had no symptoms or signs. It was only of significance on this plasma cholinesterase I referred to in my testimony.

Mr. HORAN. Might I add to that that I served on the subcommittee that appropriates for the Department of Agriculture, and we have reason to believe that the experiment being conducted in this State is of much wider importance than just in the State of Washington.

We have considerable complaint in the South where dusting for boll weevil under moderate winds has created considerable damage—complaint, not of the public-health nature, but of an economic nature, for distances up to half a mile. I think in some complaints, it was beyond that.

Dr. SEALEY. Here you mean herbicides?

Mr. HORAN. Well, it is against the boll weevil. I am not sure of the chemical they were using there. But it is the same drift of dust from an airplane being used for the purposes of spraying insecticide or pesticide or herbicide or whatever you want to use. It is applicable in each case. So the work that is being done in this State to make those determinations is widely beneficial and important.

Dr. SEALEY. I think an excellent example is the grapegrowers. The vines are quite sensitive to 2, 4–D and the effect for a matter of over a mile away is quite serious damage.

Mr. HORAN. Surely.

Mr. JONES. Any other questions of Mr. Shaw?

Mr. KLEINFELD. No.

Mr. JONES. Thank you, Mr. Shaw.

Dr. MILLER. Mr. Chairman, I hope counsel will try to find out from someone who might be here who can answer as to parathion phosphate, what method is used to determine its presence on fruit, and

how efficient that method is, and how much, if any, residue is permitted on fruit when it is shipped out.

Now they are apparently using parathion, and I think we should have more evidence in the record as to what it is, how it is used, and what method is used to find out how much is left by the time of shipment. It is said if you do not use it 30 days before shipment, that it disappears. But I think there should be more light on that particular subject.

Mr. KLEINFELD. We are going to have a witness in Los Angeles who is going to discuss parathion.

I think the informal tolerance is about two parts per million. But we are going to have an entymologist discuss parathion in the Los Angeles area.

Mr. JONES. Call your next witness.

Mr. KLEINFELD. Mr. Carter.

Mr. HORAN. Mr. Chairman, I have to leave now. I have to return to Wenatchee. But I wish to have brought out with Mr. Carter's testimony the relationship of the State of Washington to the Federal Government in our attempts here as a State government to cooperate with the Federal Government on a partnership basis to make sure that our producers are shipping out that which the consumer is able to safely consume, and to show a balance between the two. We have not always had it.

I am glad Mr. Carter is here, and I am only sorry I have to leave now. But I would like to have that brought out very definitely, because we here in the State of Washington are trying to do the right thing, and I am glad to have Mr. Carter in the position he has, which is a relatively new position. I am happy that it exists.

Mr. JONES. We regret that Mr. Horan has to leave at this time and he will join us at our hearing in San Francisco.

I should have stated earlier today that Dr. Hedrick from West Virginia, who has been acting chairman on this trip, is unable to be with us today because of illness.

Mr. Carter, if you will please stand.

(The oath was administered by the chairman.)

Mr. JONES. Would you like to read your statement?

Mr. CARTER. Gentlemen, I just do not believe it is necessary to go through this statement. It is a duplicate probably of what has been said before.

Mr. JONES. If there is no objection, then we shall include this statement in the record and have you make pertinent comment on the statement and then be subject to questions? Is that satisfactory?

Mr. KLEINFELD. In fact, we asked Mr. Carter to prepare a short summary and to have the whole statement put in the record.

Mr. JONES. That is fine.

TESTIMONY OF THOMAS A. CARTER, SUPERVISOR, FOOD AND DRUG DIVISION, STATE DEPARTMENT OF AGRICULTURE, OLYMPIA, WASH.

Mr. CARTER. I have a short summary.

The use of chemicals in the production, processing, preparation, and packaging of food products here in the State of Washington is, by virtue of the fact that the agriculture of the State is both highly di-

versified and specialized, one of the most highly specialized and highly developed phases in the production of food and food products. For instance, in the apple industry, one of the State's largest in the agricultural field, sufficient research has been carried out to develop the best methods of controlling the codling moth in the orchards by the use of DDT sprays and dusts, applied both by ground and air equipment, but the problem of controlling this pest in empty apple containers, and in containers in storage, has required a different approach. DDT cannot be used in this instance because of the residue problem. Codling moth larvae "spin up" in the crevices in these crates or boxes and thus pass the winter in protected places. The larvae pupate and emerge as moths in the spring, and since the containers are shipped out in the spring or returned to the growers without any effort being made to keep the containers used by each grower separate, the infestation is continually spread, empty crates providing a new crop of moths each year. The methods of dipping and spraying the crates with various solutions of chemicals or allowing the moths to emerge in tightly screened rooms where they eventually die, have not proven satisfactory. Increasing use of methyl bromide and other gases which easily penetrate the cocoons and kill the larvae has been tried.

However, with this method, great care must be taken that all fruit is removed during the fumigation period or the apples will be injured by the action of the methyl bromide through prolonged exposure. The action of this chemical also increases the ripening rate of immature apples, but has no effect on the apples that are more mature at the time of treatment. Considerable work has been done to determine the effect of the chemical on the apple from the standpoint of injury and resulting lessening market value of the fruit, but there is a need for research to determine the physiological effects on humans following consumption of fruit thus treated. Determination of residual chemicals on fruit would be difficult to determine, since methyl bromide is used as a gas and is hard to detect with residual chemical tests. The differences between the injury and the lessening market value of the fruit, and subsequent physiological changes in humans following consumption of such fruit, have not been given the same consideration. The reason for this is possibly found in the grade standards on which the fruit is marketed. Anything that affects the fruit as far as grading is concerned, and that may result in a lower market price, appears to be most important, while factors inducing changes that do not appear visible and are not covered under the grading standards, are not being considered of the same importance. The research which has been carried out by chemical companies, food growers' associations, State colleges, and the Federal Department of Agriculture, has produced many valuable aids in the protection of food products, but there is still a gap in knowledge between the actual control and protective measures, and the end results of such measures. The gap exists when we try to determine the effects of the chemicals used from the standpoint of the physiological changes induced in the food products themselves, and the effects of such changes when the food is eaten or processed for human consumption. This, then, is the research field that is requiring the most attention at the present time.

The effect of the use of insecticides for crops is undoubtedly the greatest danger potential of all types of chemicals used. By the very nature of their characteristics, these chemicals present the greatest hazard to human health and welfare. The residual effect of these and other insecticides does present a problem, although the growers and processors are most careful to follow the necessary procedures in order that there will be no residual concentration of chemicals in excess of the tolerance as required by law. The greatest danger appears to be to the applicator while he is applying the chemicals, and one of our problems is in educating these applicators, both commercial and grower, in the safest practices for their own protection in the application and use of these newer organic chemicals. For the most part, these chemicals dissipate and do not have a great residual effect when applied correctly and far enough in advance of the harvest. When we consider that in 1949 alone, some 600,000 pounds of parathion dust was applied in this State, we can appreciate the need for care in its use. The deaths of three persons, and the serious illness of another following work in applying parathion, should serve as a warning to all that the greatest of care and precaution must be taken in applying this chemical.

While the use of 2,4–D and other herbicides of an organic nature have not caused any particular difficulty as far as residual effect on crops is concerned, 2,4–D has caused considerable damage to susceptible crops in this State through drift, misapplication, and careless use. In all but one of the 21 cases reported in 1950, it was found on investigation that the damage could have been prevented had the applicators known the limitations of their equipment, and the inherent dangers of the formulations of the 2,4–D they used, and the climatic and topographical limitations of its use. The State of Washington has set up operational standards and requirements for these applicators and has provided a system of hearings for the purpose of taking evidence when such damage occurs, but the most important factor in preventing such damage in the first place is to educate the applicator so that they will know what to apply, how to apply it, and the conditions under which it should not be applied.

The manufacture of fertilizer here in the State of Washington is not a large industry as far as the production of the basic major elements, namely, nitrogen, phosphorus, and potassium are concerned. The most active industry in fertilizers here involves mixing of the "simples" to produce various mixes under various brand names, and the distribution of these local mixes. Some basic production, primarily of superphosphate, is carried out here, but the greater amounts of these simples are imported from other States and from Canada. The use of fertilizer is extensive in this State and is increasing all the time, the greatest increase being east of the Cascade Mountains, in the wheatfields of eastern Washington. The increase is significant when we note that it is represented almost entirely by the purchase and use of Elephant Brand Nitraprills (ammonium nitrate) on the wheatfields. Use of this fertilizer has increased from less than 1 percent in 1949, to the leading brand in volume representing 11.4 percent in 1951.

Commercial fertilizers used in this State are represented by almost 99 percent of the inorganic or chemical type, while the remainder represents the organic type. Since the initial work in soil deficiencies

carried out by Sir John Orr, who first established the relationship between a soil lacking in phosphorus and a malformation in bone structure in humans in areas where this condition existed, soil workers throughout the world have attempted to determine the soil condition as far as deficiencies were concerned, and the corrective measures necessary to establish a complete growing medium in the soil to counteract the natural deficiencies. Orr proved that when a soil was deficient in phosphorus, the vegetation growing in that soil was likewise deficient in phosphorus, and that the cattle feeding on such vegetation were deficient in phosphorus, with the result that humans eating the meat of such cattle and the vegetation growing in such soils were deficient in the same element, with resulting bone malformations in the people. We find in certain areas of this State that the soils do lack certain essential elements. In some cases this deficiency is a natural one, and in others it is man-made. We find, for example, a zinc deficiency in certain apple-growing areas. To correct this condition requires the application of zinc, but this cannot be done through the soil as the amounts required would lead to the development of a toxic condition of the soil. The solution has been found in the application of zinc chemical sprays to the fruit trees as they are breaking dormancy. This is applied by means of ground sprayers or through aircraft. In this way the trees can absorb sufficient zinc through its tissues to overcome the natural deficiencies of the soil, and no toxic condition is allowed to develop in the soil.

A boron deficiency that exists in some of the fruit and alfalfa growing fields, is corrected through the application of minute amounts of boron by aerial or ground applicators, in quantities sufficient to counteract the deficiency and yet not in the larger amounts that would cause a soil sterility problem. Ammonium nitrate is applied in the same manner on soils deficient in nitrogen, and particularly on the wheat fields, there is an additional reason for supplying this material. Under dry land wheat farming conditions, the stubble is plowed back into the soil, and the bacteria that decomposes this stubble requires nitrogen as a food. This uses up a large amount of the natural soil nitrogen which results in loss of nitrogen for crop growth. The use of ammonium nitrate has greatly increased field yields, which was proven in test fields, adjoining fields in which the same methods were used for growing wheat, and which received the same amounts of rainfall, but which were not treated with ammonium nitrate. However, the use of too much of this material may result in the "burning" of the wheat crop, therefore, the moisture profile, stubble and straw content, and soil analysis must all be determined accurately before the application of this material. There have been cases where basic residual fertilizers have been applied to alkali soils and have resulted in an impermeable condition. In others, phosphorus fertilizer combinations and lime have been added to soils that are acid in nature with the result that such soils tend to show a phosphorous fixation. Again, excess boron has been applied to soils deficient in this element with the result that the boron caused a temporary sterilant effect in the soil, but these cases are the exception rather than the rule. If there is a problem in this State that may be considered to be a general one, from the use of fertilizers, it is that of education of the growers as to the advantages and necessity of correct fertilization programs for their land.

Commercial fertilizers offered for sale in this State must be registered and the total and available ingredients shown on the tag or label. The State Department of Agriculture maintains an inspection service to make sure that such fertilizers do contain the ingredients as stated on the tag or label.

Stock growers should, when a soil is deficient in some necessary element to the stock feeding on such land, either correct the deficiency in the soil, or he must supplement these elements in the ration of the animal. In this State, the latter procedure seems to be the most popular, as many stock growers feel that they get a better return, and better control of the necessary elements in this way.

Where the correct fertilizers are applied in the right amounts and at the right time, there can be no question as to the increased yield of the quality and quantity of foods produced from such fertilized soils. Even when the moisture is limited, as it is in this State during some dry seasons, yields of crops can be increased greatly by the use of fertilizers, since the fertilizers help the plant to make more efficient use of the moisture that is present. Perhaps some day in the not too distant future, food crops will be graded, bought and sold on the basis of their nutrient value, rather than on the present system of size, color, shape, texture, firmness, and so forth.

A secondary problem that should be mentioned is that concerning the regulation of the application and use of these agricultural chemicals, many of which are more toxic than some of the chemicals that are required by law to be used only upon prescription of a qualified physician, and prepared and sold only by a qualified pharmacist. This lack of regulation in the use of these lethal insecticides and chemicals is probably one of the contributing causes in the damage to health, and as we have seen in some cases, death, of individuals using such chemicals in field work without adequate knowledge of the hazards involved and the precautions that must be taken in their use.

(The prepared statement of Mr. Carter follows:)

STATEMENT OF THOMAS A. CARTER, SUPERVISOR, FOOD AND DRUG DIVISION, STATE DEPARTMENT OF AGRICULTURE, OLYMPIA, WASH.

In response to your request for information pertaining to the use of chemicals in the production of food products, the effect of the use of pesticides and insecticides with respect to food products, and the effect of the use of chemicals in the manufacture of fertilizer, I am pleased to submit, for your information and consideration, the following brief résumé of the situation as it exists here in the State of Washington.

In order that a continuity be established in considering the various aspects of such a broad subject, I am taking the liberty of following the general outline covering the scope of the problem as suggested by House Resolution 323, Eighty-first Congress, second session, as follows:

1. The nature, extent, and effect of the use of chemicals, compounds, and synthetics in the production, processing, preparation, and packaging of food products to determine the effect of the use of such chemicals, compounds, and synthetics: (A) upon the health and welfare of the Nation; and (B) upon the stability and welfare of our agricultural economy

The use of chemicals in the production, processing, preparation and packaging of food products here in the State of Washington is, by virtue of the fact that the agriculture of the State is both highly diversified and specialized, one of the most highly specialized and highly developed phases in the production of food and food products. A few examples will serve to illustrate the nature of the problems and the corrective actions taken to solve the problems.

In the apple industry, one of the State's largest in the agricultural field,

the problem of controlling the codling moth is of greatest importance. The control of this insect in the orchards is achieved through the use of DDT sprays and dusts, applied both by air and ground equipment. Sufficient research has been carried out to develop the best methods of controlling this pest in the field, but the problem of controlling the codling moth in empty apple containers and in containers in storage has required a different approach. The DDT cannot be used for this purpose due to residual problems, and yet the insect must be controlled. Codling moth larvae "spin up" in the crevices of these crates or boxes and thus pass the winter in protected places. These larvae pupate and emerge as moths in the spring.. Since the containers are shipped out in the spring or returned to the growers without any attempt being made to keep the containers used by each grower separate, the infestation is continually spread, providing an added or new "crop" of moths which emerge from these crates.

Former methods of control involved dipping and spraying the crates with various solutions (chemical) or allowing the moths to emerge in tightly screened rooms where they eventually die. These methods have not proven satisfactory, and as a result increasing use has been made of methyl bromide and other gases which easily penetrate the cocoons and kill the larvae. One factor that must be noted is that care must be taken to remove any fruit during the fumigation period; otherwise, the apples will be injured by the action of methyl bromide through prolonged exposure. The action of the chemical also increases the rate of ripening of immature apples, but has no influence on apples that are more mature at the time of treatment.

The imporant factor to be pointed out in connection with this treatment is that, while considerable work has been carried out to determine the effect of the chemical on the apple from the standpoint of injury and resulting lessening market value for the affected fruit, there is a need for research to be carried out to determine the effect of such a chemical treatment on the apples from the standpoint of the physiological effects on humans following consumption of such apples. It would be difficult to classify such chemical effect from the standpoint of determination of residual chemicals on the fruit, since the methyl bromide is used as a gas, and is, therefore, difficult to detect with residual chemical tests.

This procedure indicates the gap that is present in the use of many chemicals in the preparation and processing of food products; i. e., the advisability of using such chemicals from the standpoint of the effects of chemicals on the appearance, color, etc., of the fruit is given great consideration, while the effects of such chemicals on the physiological changes induced in the fruit and subsequent physiological changes in humans following consumption of such fruit is not given the same consideration. The reason for this is possibly found in the grade standards on which the fruit is marketed. Anything that affects the fruit as far as grading is concerned, and that may result in a lower market price, is most important, while factors inducing changes that do not appear visible and are not covered under the grading standards are not considered of the same importance.

It is essential that all possible protective procedures be followed in the processing, storage, and preparation of our foods and food products. To this end, a great deal of research has been carried out by chemical companies, food growers' associations, State colleges, and the Federal Department of Agriculture. This research has produced many valuable aids in the protection of food products, but there is still a gap in knowledge between the actual control and protective measures and the end results of such measures. The best control measures for any given pest condition can be determined, and the residual chemical tolerances can be worked out, but the gap exists when we try to determine the effects of the chemicals used from the standpoint of the physiological changes induced in the food products and the effects of such changes when the food is eaten or processed for human consumption. This, then, is the research field that is requiring the most attention at the present time.

2. The nature, extent, and effect of the use of pesticides and insecticides with respect to food and food products, particularly the effect of such use of these pesticides and insecticides upon the health and welfare of the consumer by reason of toxic residues remaining on such food and food products as a result of such use

As has been previously mentioned, due to the great diversity of agricultural and horticultural crops grown here in the State of Washington, extensive use is made of practically all known insecticides, fungicides, herbicides, and ferti-

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lizers. Perhaps one method of demonstrating the extent of use of these chemicals is to compare the use and consumption of some of these chemicals for the year 1949 in comparison with the year 1951. This may be outlined as follows:

	Unit of quantity	1949	1951
Insecticides for crops (sprays)	Pint	187,508	337,676
Insecticide sprays for livestock	Quart	206,510	223,453
Seed-treatment chemicals	Pound	228,089	216,082
Liquid weed-killer chemicals	Gallon	207,734	348,949
Powdered weed-killer chemicals	Pound	2,261,801	1,394,533

It may be pointed out that the amount of insecticides in dust form is not given. It was not possible to obtain this figure due to the number of small dust-mixing plants in operation, and to the fact that use of insecticide dusts for the year 1951 have not been completed at the time of preparation of this report. Since by far the greater amount of insecticides are applied to crops in the State of Washington in dust form, it may be assumed that this will represent the majority of the insect-control chemicals.

The increase in the use of chemicals in this State is shown not only by the volume increase but also by the increase in the number of farms using these materials. In 1949, 10.3 percent of Washington farms purchased all the insecticide crop sprays. In 1951, this has increased to 18 percent. In 1949, 16.6 percent of the farms used an average of 17.2 pounds of seed-treatment chemicals each. In 1951, 16.1 percent of the farms used an average of 16.8 pounds, showing a decrease in the use of these chemicals.

In 1949, 24 percent of Washington farms used an average of 18.2 gallons of liquid weed-killer chemicals each. In 1951, this had increased to 30.3 percent of the farms using an average of 12.3 gallons each. About 90 percent of this was in the form of 2,4–D (2,4–dichlorophenoxy-acetic acid).

The question as to the effect of the use of such chemicals on the health and welfare of the consumer may be described as follows:

Insecticides for crops.—This group undoubtedly contains the greater danger potential to all types of chemicals used. By the very nature of their characteristics, these chemicals present the greatest hazard to human health and welfare. We have only to consider the estimated fatal dose of some of these chemicals to be aware of the problem:

	Estimated fatal dose (grams)
Aldrin	0.4
Dieldrin	0.6
DDT	30
Chlordane	5–60
Toxaphene	7
Organic phosphates:	
TEPP	0.012
Parathion	0.012
Nicotine	0.060
Arsenic	(1)

[1] Accumulative.

The residual effect of these and other insecticides does present a problem. However, the growers and processors are most careful to follow the necessary procedures in order that there will be no residual concentration of chemical in excess of the minimum tolerances as required under the law. Arsenic formerly presented one of the biggest problems in this respect; but, with the advent and use of organic insecticides, arsenic has largely been replaced.

The most serious problem in connection with the use of agricultural chemicals is not in the solving of residual tolerances of the chemicals used but in the education of the applicators of such chemicals, both commercial and grower, of safe practices for their own protection in the application and use of these newer organic chemicals. For the most part, these chemicals dissipate and do not have a great residual effect when applied correctly and far enough in advance of harvest.

The greatest danger appears to be to the applicator during the application of the chemicals. In this State the use of parathion has probably provided more publicity in regard to the need for care in its application and use than any other

single insecticide. When we consider that in 1949 alone some 600,000 pounds of parathion dust was applied here, we can appreciate the need for care in its use. The deaths of Mr. Keith Hughes, University of California; Mr. William Furnace, Clayton, N. C., and Mr. Cecil Pendarvis, Lake Placid, Fla., following work in applying parthion, and the serious illness of Mr. J. Chiara of Prosser, Wash., can only serve as a warning to all that the greatest of care and precaution must be taken in the application of this chemical.

Again, the question of what effect do insecticides, particularly the newer organics, have on food products from the physiological standpoint is one that requires a great deal of research before we can be absolutely sure that food products, or crops so treated, do not differ in some small and as yet undetected way from crops not treated.

While the use of 2,4–D and other herbicides of an organic nature has not caused any particular difficulty as far as residual effect on the crops is concerned, 2,4–D has caused considerable damage to susceptible crops in this State through drift, misapplication, and careless use. In 1950, 21 cases of crop damage from this cause amounting to a total of $44,127.99 were reported. On investigation it was found that in all but one of the cases the damage could have been prevented had the applicators known the limitations of their equipment and the inherent dangers of the formulations of 2,4–D they used, together with the climate and topographical limitation of its use. The State of Washington has set up operational standards and requirements for these applicators and has provided a system of hearings for the purpose of taking evidence when such damage occurs, but the most important factor in preventing a recurrence of such damage is the education of the applicators in order that they will know what to apply, how to apply it, and under what conditions not to apply the herbicides, in order to avoid the possibility of damage to susceptible crops.

3. The nature, extent, and effect of the use of chemicals, compounds, and synthetics in the manufacture of fertilizer, particularly the effect of such use of chemicals, compounds, and synthetics upon (*a*) the condition of the soil as a result of the use of such fertilizer, (*b*) the quantity and quality of such vegetation growing from such soil, (*c*) the health of animals consuming such vegetation, (*d*) the quantity and quality of food produced from such soil, and (*e*) the public health and welfare generally

The manufacture of fertilizer here in the State of Washington is not a large industry as far as the production of the basic major elements, namely, nitrogen, phosphorous, and potassium are concerned. The most active industry in fertilizers here involves the mixing of the "simples" to produce various mixes under various brand names, and the distribution of these local mixes. Some basic production, primarily of superphosphate, is carried out here, but the greater amounts of these simples are imported from other States and from Canada.

Fertilizers are used rather extensively in Washington and their use is increasing all the time. The greatest increase in recent years has taken place east of the Cascade Mountains, particularly in the wheatfields of eastern Washington. The increase may best be illustrated by comparing the volume of fertilizers used in 1949 with 1951. In 1949, 41.2 percent of Washington's 79,877 farms used an average of 5,237 pounds of fertilizer each, for a State total of 172,365,381 pounds. In 1951, these same 79,877 farms used an average of 7,017 pounds each, but the percent of farms buying fertilizer increased to 42.4 percent and the total increased to 237,679,824 pounds. This represents an increase of 65,314,443 pounds on a farm use increase of only 1.2 percent. This large increase on so few farms is due to the use of fertilizers on the large wheat farms of eastern Washington, that previously used no fertilizer at all.

This increase is significant when we note that the increase is represented almost entirely by the purchase and use of Elephant brand nitraprills (ammonium nitrate, on the wheat fields. This has pushed the use of this fertilizer from less than 1 percent in 1949 to the leading brand in volume representing 11.4 percent in 1951.

Commercial fertilizers used in this State are represented by almost 99 percent of the inorganic (chemical) type, while the remainder are represented by the organic types. This does not include the large acreages that are fertilized each year by the means of cover crops which are organic in nature, since the figures for this type of fertilization are not available.

The effects of the use of fertilizers may best be stated as follows: Since the initial work in soil deficiencies carried out by Sir John Orr, who first established the relationship between a soil lacking in phosphorus and a mal-

formation in bone structure in humans in areas where this condition existed, soil workers throughout the world have attempted to determine the soil condition as far as deficiencies are concerned, and the corrective measures necessary to establish a complete growing medium in the soil to counteract the natural deficiency. Orr proved that when a soil was deficient in phosphorus, the vegetation growing in that soil was likewise deficient in phosphorus, and that the cattle feeding on such vegetation were deficient in phorphorus, with the result that humans eating the meat of such cattle, and the vegetation growing in such soils were deficient in the same element, with resulting bone malformation in the people.

Here in the State of Washington, we find that in certain areas the soils do lack certain essential elements. In some cases this deficiency is a natural one, and in others it is man-made. We find, for example, a zinc deficiency in certain apple-growing areas. To correct this condition requires the application of zinc, but this cannot be done through the soil as the amounts required would lead to the development of a toxic condition of the soil. The solution has been found in the application of zinc chemical sprays to the fruit trees as they are breaking dormancy. This is applied by means of ground sprayers, or by aircraft. In this way, the tree can absorb sufficient zinc through its tissues to overcome the natural deficiency in the soil, and no toxic condition is allowed to develop in the soil.

In the case of the boron deficiency that exists in certain of the fruit- and alfalfa-growing soils, this is corrected through the application of minute amounts of boron by aerial or ground applicators, in sufficient quantities to counteract the deficiency and yet not in the larger amounts necessary to cause a soil-sterility problem.

In the same manner, in soils suffering from a man-made deficiency of nitrogen, such as many of the wheatfields, this is overcome through the aerial or ground application of nitrogen, usually in the form of ammonium nitrate. There is an additional reason for the application of this material. Under dry-land wheat-farming conditions, the stubble is plowed back into the soil. The bacteria that decomposes this stubble requires nitrogen as a food. This uses up a large amount of the natural soil nitrogen and thus results in less nitrogen being available for crop growth. If the soil is so lacking in nitrogen as to prevent the actual decomposition of the stubble, this hard straw material accumulates in the soil to the extent that it interferes with the normal moisture absorption and movement in the soil. The benefits of application of this chemical can best be illustrated by some of the yields obtained this year in eastern Washington. On farms where the normal yields have been from 10 to 20 bushels per acre, the use of ammonium nitrate has increased yields from 8 to 15 bushels per acre. Since these test fields were adjoining other fields that were cultivated, seeded, etc., in the same way and received the same amounts of rainfall, the increased yield can only be attributed to the use of the fertilizer.

One factor of some importance is that this material cannot be applied at random. The moisture profile, stubble and straw content, and soil analysis must all be determined accurately, otherwise, the use of too much nitrogen will result in the "burning" of the wheat crop, and its loss as far as good yields are concerned. Again, should nitrogen be applied to soil that does not require this element, the grain will in most cases make too rapid a growth and will then lodge before it can be harvested. These factors all point to the necessity of sound accurate soil determination being made before any fertilizer is applied.

As to the effects of fertilizers on the soil structure and condition in this State, for the most part, the fertilizers used at the present time do not cause any great losses in this respect. There have been cases where basic residual fertilizers have been applied to alkali soils and have resulted in an impermeable condition developing in such soils. In others, phosphorus fertilizer combinations and lime have been added to soils that are acid in nature with the result that such soils tend to show a phosphorus fixation. Again, excess boron has been applied to soils deficient in this element with the result that the boron caused a temporary sterilant effect in the soil, but these cases are the exception rather than the rule. For the most part, the work carried out by the State college and the experimental stations has shown the growers the correct materials to use and the right amounts to apply in addition to the correct manner of application and the timing of such applications. If there is any problem that may be considered to be a general one from the use of fertilizers in this State, the problem is that of education of the growers as to the advantages and necessity of correct fertilization programs for their land.

Commercial fertilizers offered for sale in this State must be registered and the total and available ingredients shown on the tag or label. The State Department of Agriculture maintains an inspection service to make sure that such fertilizers do contain the ingredients as stated on the label.

As to the health of animals consuming vegetation from fertilized lands, when a soil is naturally deficient in some necessary element, the stock grower must do one of two things: He may correct the deficiency in the soil, or he must correct the deficiency by supplemental feeding of the deficient elements in the ration of the animal. Here in the State of Washington, we find the latter procedure to be the most popular, as many stock growers feel that they can get a better return and better control of the necessary elements by such a program. Where stock feed on fertilized ranges and pastures, there have been no cases to our knowledge where such stock suffered any effects other than good from the use of such fertilizers.

Quality and quantity of food produced from fertilized soil: Where the correct fertilizers are applied in the right amounts and at the right time, there can be no question as to the fact that yields will be increased. It was shown many years ago at the great agricultural experiment station at Rothamstead, England, that yields of crops growing in the same soil can be increased when the soil is fertilized, even when the soil moisture is very limited, as is the case in many areas in this State during dry years. The reason for this is that plants growing in a fertilized soil can make more efficient use of whatever moisture is present, even though such moisture is limited.

The quality of foods grown in correctly fertilized soil may be stated to be much higher than that grown in unfertilized soil, other factors being equal. We have evidence of this in the increased protein content of wheat grown in this State when commercial nitrogen fertilizers are used. We have further evidence that when a soil is deficient in an essential element such as phosphorous, and when the condition is corrected by the addition of a phosphorous fertilizer, there can be no question as to the increased food value of the crop grown in the fertilized soil. Nor is this limited to field crops. We have evidence that in the case of strawberries, those berries grown in a completely fertilized soil show almost twice the vitamin C content of berries grown in unfertilized soil.

Perhaps some day in the not too distant future, food crops will be graded, bought and sold on a basis of their nutrient value, rather than on the present system of size, color, shape, texture, firmness, etc.

As to the public health and welfare generally, it may be stated that the problems connected with the application and use of agricultural chemicals in this State do not resolve themselves so much with the actual growing of crops from the agronomic standpoint, but rather with the application and use of these chemicals.

The dangers involved in the mixing and actual application of insecticides have for the most part been the cause of injury to humans, and to some extent to livestock. The damage caused by careless, negligent application and by the lack of knowledge as to the hazards involved, with the use of 2,4–D and other herbicides, to susceptible crops has caused greater dollar losses than have been caused by the residual effects of these chemicals.

The primary problem as we see it is lack of information as to the physiological effects of the chemicals used on the crops to which they are applied and the resulting physiological changes, if any, that may develop in the human system following the ingestion of such food crops.

A secondary problem is that concerning the regulation of the application and use of these agricultural chemicals, many of which are more toxic than some of the chemicals that are required by law to be used only on prescription of a qualified physician and prepared and sold only by a qualified pharmacist. This lack of regulation in the use of these lethal insecticides is probably one of the contributing causes in the damage to health, and as we have seen in some cases, death, of individuals using such chemicals in field work, without adequate knowledge as to the hazards involved and the cautions that must be taken in their use.

I trust that we have been of assistance to you with the presentation of the above.

Mr. JONES. Dr. Miller, do you have any questions?

Dr. MILLER. I have a few general questions.

I have gone through your statement rather hurriedly here, of course. The thing I wanted to ask about was, first, the use of certain fertilizers. You state on the last page here that the

use of these agricultural chemicals—

referring to fertilizers—

many of which are more toxic than some of the chemicals that are required by law to be used only on prescription of a qualified physician and prepared and sold only by a qualified pharmacist.

Do I understand from that that you feel that there should be more regulation of those chemicals and insecticides?

Mr. CARTER. No. You probably understood that to mean—I would say that eventually something like that might happen.

Dr. MILLER. You have an interesting observation, too, that perhaps some day in the future crops will be graded and bought and sold on the basis of their nutrient value rather than on the present system of size, color, shape, texture, and firmness. That is brought about, I presume, by the proper use of fertilizers to raise these things?

You speak about strawberries having twice as much vitamin C when properly fertilized.

Mr. CARTER. That is true.

Dr. MILLER. Are you familiar with any other fertilizers besides ammonium nitrate?

Mr. CARTER. Not too much; no, sir.

Dr. MILLER. Would you guess that there are other fertilizers that might be used and are being used as fertilizers?

Mr. CARTER. Well, I would say "yes" to that question.

Dr. MILLER. But you are not familiar with any outside of the ammonium nitrate?

Mr. CARTER. No, sir; not too familiar.

Dr. MILLER. And you think ammonium nitrate is the main fertilizer in the growing of certain crops?

Mr. CARTER. I think it is very good.

Dr. MILLER. Are you familiar with selenium as used as an insecticide?

Mr. CARTER. Not too much; no.

Dr. MILLER. Of course, we know that other chemicals when they are in the soil cause certain effects upon animals. I think there are places in Canada and even in the United States where the lack of iodine in soil has caused hairless animals and the loss of their offspring and even people do not do well unless they take iodines and have a properly balanced mineral and chemical diet. The Indians found that out and thought that some of these places had some kind of an evil spirit residing in them because they did not do well when they lived in those areas where there was a lack of certain minerals and salts. So we do know that the minerals and salts in proper balance are important.

I want to ask you this: On the use of ammonium nitrate, what is your opinion, how would you evaluate that use and the use of good old cow manure or horse manure on the land? Which would you prefer to have if you were a farmer out here trying to make a living?

Mr. CARTER. If I were a farmer out here, I would prefer the good old fertilizer.

Dr. MILLER. I think the good old compost fertilizer is better in the long run for the soil, the land, than the use of chemicals. Do you?

Mr. CARTER. I personally believe so. Maybe it is my imagination.

Dr. MILLER. I agree with you.

Tell me what effect will the use, not so much of the fertilizers but of all of these insecticides that are being used, have upon the soil of the land? Does it contaminate the soil eventually to the point that you have some other problems that you don't presently have?

Mr. CARTER. It might eventually—too much of it.

Dr. MILLER. For instance, DDT might be held in the soil, or lead. In some places they use a lot of phosphorus and lead and arsenic and everything under the sun to spray and kill insects with. Isn't some of that contained in the soil?

Mr. CARTER. Well, I presume some of it is.

Dr. MILLER. Do you have any knowledge as to what happens when you combine another chemical like ammonium nitrate with the soil that is contaminated with all these things?

Mr. CARTER. No, I haven't. I couldn't answer that question.

Dr. MILLER. Counsel for the committee gives us something on a report of the effect on soils of certain insecticides, especially DDT:

> Because of the great persistence of the toxicity of DDT and its relatively high toxicity to many crops on the mineral soils on which it has been tested, it appears that harmful residues will accumulate under some conditions of use in as short a time as 3 to 5 years. It is probable that residues harmful to some cover crops have been developed already in certain orchards in which 30 to 40 pounds or more have been applied per acre per year. In orchards the toxic effect should be first noticeable on the cover plants under the trees where the DDT has accumulated from drip, and fall of leaves. In areas where the DDT has been applied uniformly to crops over a field there will be no localized concentration, as in orchards, to emphasize or make clear its toxic effects. In the absence of any specific symptoms a more or less uniform reduction in growth over the field may thus escape detection until it has gradually progressed to a serious degree. The lack of clear-cut symptoms of injury and the lack of control, or untreated areas, within single fields probably will delay discovery of injury until considerable damage has been done to the productivity of fields that regularly receive substantial dosages.

If I am not right, counsel can tell me. I take it that the contamination of the soil which occurs by reason of the use of some of these chemicals must eventually get to be a problem. Is that what the article says?

Mr. KLEINFELD. Yes. What you read is from Circular No. 862, issued March 1951, by the United States Department of Agriculture, entitled "Some Plant Responses to Certain Insecticides in the Soil." It does bear on the problem you are raising, which I don't think has been raised heretofore before this committee. There have been instances, according to this circular, where damage has been done to the soil by the continued and perhaps injudicious use of insecticides.

Dr. MILLER. I wonder if you have noticed in this area whether there has been any damage done to the soil.

Mr. CARTER. No, sir; I have not.

Dr. MILLER. Do you think there might possibly in the future be some damage by the long, continued use of these insecticides?

Mr. CARTER. I don't think there would be too much danger of it.

Dr. MILLER. That is all.

Mr. JONES. I have one question. Would it be likely that reports of cases of illness from DDT would come to your department or division?

Mr. CARTER. Yes; it would.

Mr. JONES. Have there been many of those cases reported to you?

Mr. CARTER. Not too many. Mostly our complaints have been on, I believe, 2, 4–D.

Mr. JONES. Well, I mean to find out about DDT. Have there been any fatalities that you know of in the State of Washington from that?

Mr. CARTER. Not of DDT.

Mr. JONES. Have there been any cases of severe illness, Mr. Carter?

Mr. CARTER. I think there have been cases of sickness.

Mr. JONES. But you do not know the severity of the illness?

Mr. CARTER. No, sir.

Mr. JONES. Are you acquainted with the possible contact with DDT that causes that illness?

Mr. CARTER. No, sir; I am not too familiar with that.

Mr. JONES. That is all.

Dr. MILLER. If you don't mind following right up there—you spoke about the complaints on 2,4–D. Would you elaborate on that a little more? What complaints have you had?

Mr. CARTER. They have been these: Complaints of 2,4–D, people being sick and they have blamed it on 2,4–D. Of course, it has not been proved that it was 2,4–D.

Mr. JONES. Was that because of their handling 2,4–D or breathing it?

Mr. CARTER. Breathing it.

Dr. MILLER. Have you also had some complaints as to 2,4–D killing certain plants that you did not want harmed?

Mr. CARTER. Yes, sir, we have.

Dr. MILLER. What plants does 2,4–D harm? Could you sum it up for us?

Mr. CARTER. Dr. Sealey just mentioned a little while ago about grapevines, for instance. We have had complaints and have held hearings.

Dr. MILLER. Would you say broadleaf plants? Would that cover it?

Mr. CARTER. Broadleaf plants, yes, sir; that would cover it.

Mr. JONES. Mr. Kleinfeld?

Mr. KLEINFELD. I might, perhaps, if you so desire, read some conclusions reached in this pamphlet.

Dr. MILLER. I wish you would.

Mr. KLEINFELD. This is Circular No. 862, dated March 1951, of the Department of Agriculture. Here in part is what this circular concludes:

> Agricultural chemicals that are to be applied to crops or soils year after year should be either nontoxic to plants when mixed in the soil or nonaccumulative in the soil.
>
> Persistent toxic substances that will accumulate in the soil upon repeated use at short intervals should be replaced by nonpersistent, or nontoxic substances.
>
> Pending the development of more definite information on the accumulative effects of various new agricultural chemicals under practical field use, such chemicals should be used only when others are known to be ineffective. Dosages and frequency of application should be kept strictly to the minimum recommended by competent specialists. Improvising, improper use, and excessive use by growers are to be firmly discouraged because they often cause serious losses.

Heavy annual use DDT, technical BHC, and probably other persistent chlorinated hydrocarbons appears to have definite danger of reducing within comparatively few years the productivity of soils to which they are applied.

Research workers, in both public and private organizations, should investigate the accumulative effects of the new agricultural chemicals as extensively as possible in the immediate future to determine safe limits of use on the different soils for various crops in the several States. It is especially important that these studies be made in order to insure against the use of any persistent substance to the extent that it causes a reduction in soil productivity.

It is similarly important to determine which new substances can be used indefinitely with little or no danger of accumulating harmful residues. The use of valuable and safe substances should be encouraged. The commercial production of such substances should be increased to permit an orderly replacement of persistent toxic substances before trouble is encountered from too-long continued use of the latter.

Those are the conclusions contained in that circular of the Department of Agriculture.

Dr. MILLER. I wonder whether the result would be any different depending on whether it was put on dry or wet.

Can the witness say whether there would be any difference in the effect if the insecticides were used in dry or wet form.

Mr. CARTER. The effectiveness on the fruit?

Dr. MILLER. Yes.

Mr. CARTER. I would not want to make a statement. I might say that I think, if it were put on wet, it would not have the effect as if it were put on dry.

Dr. MILLER. It would not have the drift, either.

Mr. CARTER. That is right.

Dr. MILLER. Over an area. That is the reason I wondered whether it would have the same effect or not.

Mr. KLEINFELD. Mr. Carter, as far as the fertilizer situation is concerned, do you believe that the situation in this State is satisfactory?

Mr. CARTER. Yes; I do, very satisfactory.

Mr. KLEINFELD. You see no need for any Federal regulation in that field?

Mr. CARTER. No, sir; I do not.

Mr. KLEINFELD. On page 2 of your statement, Mr. Carter, you talked about a gap that was present in the use of many chemicals in the preparation and processing of food products. Would you mind explaining that in a little greater detail?

Mr. CARTER. What was that, Mr. Kleinfeld?

Mr. KLEINFELD. On page 2 of your original statement you talk about the procedure which you mention, indicating a gap that is present in the use of many chemicals in the preparation and processing of food products. Just what do you mean by that?

Mr. CARTER. I still do not see that.

Mr. JONES. Is that the second paragraph?

Mr. CARTER. Yes.

Mr. KLEINFELD. The middle of the page, the paragraph beginning, "This procedure indicates the gap that is present."

I thought he might explain to the committee what he has in mind.

Mr. CARTER. I do not know what to say on it.

Mr. KLEINFELD. You have nothing to add to what is in there?

Mr. CARTER. No, sir.

Mr. KLEINFELD. I have no further questions.

I thought, if I could, Mr. Jones, I would like to recall Dr. Dille for a few questions.

Mr. JONES. I think, also, on Mr. Carter's testimony, preliminary to that, we should have some background of his qualification, experience, and so forth, prior to his appointment as supervisor of the food and drug commission. If he would just give us a little summary of it, it can be inserted.

Mr. KLEINFELD. Please state your academic and professional background and we will put it in the record.

Mr. CARTER. My professional background is just some study of fertilizers.

Mr. KLEINFELD. How long have you been supervisor?

Mr. CARTER. Three years.

Mr. KLEINFELD. Three years?

Mr. CARTER. Yes, sir.

Mr. KLEINFELD. What did you do prior to that time?

Mr. CARTER. I was with the assessor's office. I was the assessor, but at that time I was taking a course in fertilizer and fertilizer materials in school.

Mr. KLEINFELD. And what have your duties been during the past 3 years as supervisor?

Mr. CARTER. I have been supervisor of the food and drug division.

Mr. KLEINFELD. What do you do?

Mr. CARTER. I have inspectors in the field. We have food inspectors in the field. We inspect for cleanliness and type of food adulterations.

Mr. JONES. Does your job come under civil-service appointment?

Mr. CARTER. No, sir.

Mr. JONES. I think that will be all.

We will recall Dr. Dille.

TESTIMONY OF J. M. DILLE, M. D.—Resumed

Mr. KLEINFELD. Besides being a medical doctor, your training has been in pharmacology?

Dr. DILLE. That is correct.

Mr. KLEINFELD. In pharmacological work, are animals widely used?

Dr. DILLE. Yes; they are. I think I can say without any reservation that they are indispensable in acquiring knowledge of the actions and toxicity of any new drug.

Mr. KLEINFELD. What is the value, if any, of the LD–50?

Dr. DILLE. Well, the term "LD–50" means a 50-percent lethal dose, and it is a key point in the study of the toxicity of any drugs.

To take a specific example—suppose a chemist made a new drug which had never been made before. Nobody would know anything about it, nobody would know what it was good for, whether it was a good headache remedy or a good insecticide. One of the first problems would be to see what it was good for, and then the immediate problem after that would be to determine whether or not it was poisonous.

Now one would hesitate to give this to human beings. And so the pharmacologist would take a group of animals, and by administering various doses to the animals he would come out with a figure which would kill 50 percent of a group of animals and that would be the 50-percent lethal dose, or the LD–50.

Mr. KLEINFELD. That might be a large amount.

Dr. DILLE. It might vary from a few milligrams to a few grams depending upon the drug.

Suppose these drugs had useful properties, the next question would be, what relation does this LD–50 on our mice or rats have to the possible LD–50 on humans? We can't take a group of humans and kill them off to find what the LD–50 is, but we have pretty good evidence that the LD–50 in animal studies bears a relationship to the LD–50 on humans, and usually the LD–50 on humans will be less than on animals. So when this drug is used for humans, the clinician can begin cautiously and with his knowledge of the effects on animals proceed to study the drug with considerable safety to the subjects in humans.

We can give you a good example of this because at the present time our Department is investigating what we think will be a very valuable anticoagulant drug, a drug used in the treatment of pulmonary emboli and other situations, and we have completed work during the past 6 months on animals.

Just in the last 2 weeks we have been using this drug cautiously in human patients.

The whole study on humans is based on what we have found on animals. We could never have tried this on humans without a background of this knowledge we gain from our animal experience.

Mr. KLEINFELD. When you conduct an LD–50 I assume you conduct autopsies of some of the animals which die?

Dr. DILLE. We may or we may not. Usually the thing breaks down into sort of a systematic study, and if we were going to conduct autopsies or detailed studies, we would probably use larger animals, which would mean the dog or the cat or the monkey. Then if we do LD–50's, it means we have to have a group or use a group of at least 40 or 50 animals. So we take the smaller animals like mice and rats, because of the problem of expense. Probably we would not do autopsy studies on the same animals on which we determined the LD–50. It would depend.

Mr. KLEINFELD. Do the LD–50's give the pharmacologist any help in determining chronic toxicity?

Dr. DILLE. Yes; they do; although that presents still a different problem.

The program would be something like this: We get the LD–50's from the acutely administered single dose, and that would be the guide as to what dose levels to pick in the future for the chronic toxicity studies.

One might start out and take one-fifth of the LD–50 and go on down to 100, taking, say, five group levels, with 25 rats in a group, carrying on those for a period of months or maybe years.

Mr. KLEINFELD. You then get leads as far as the possible effect of the continued ingestion over long periods of time of a particular thing?

Dr. DILLE. Yes.

Mr. KLEINFELD. Do you think that more than one specie of animal should be used in your test work?

Dr. DILLE. In these chronic toxicity studies at least two species, and perhaps three would be even better, should be used.

Mr. KLEINFELD. Over the span of a generation?

Dr. DILLE. The belief is that these chronic toxicity studies should be carried out over at least two generations.

Mr. KLEINFELD. To summarize, you think these animal experimental studies are essential in determining the toxicity of a new chemical or drug?

Dr. DILLE. That is right; they are essential and indispensable.

Mr. KLEINFELD. The only other substitute would be to use human guinea pigs?

Dr. DILLE. That is right.

Mr. KLEINFELD. No further questions.

Mr. JONES. Thank you, Doctor.

Have you any other witnesses?

Mr. KLEINFELD. No.

Mr. JONES. Before we leave Seattle, is there anyone here who has anything that he thinks he might add to the testimony or to the information that we are trying to compile?

If not, I would like to express again on the part of this committee the fact that we are glad to get out here and to obtain your assistance in compiling this information, which we will be helpful.

We regret that two members of our committee were unable to be on this trip to the West and Northwest, and, as expressed before, we regret that only three of the seven were able to be here this morning. But we do have five members of the committee who are attending at least part of these hearings out here in the West.

Our committee is made up of the chairman, Mr. Delaney from New York, Mr. Abernethy from Mississippi, Dr. Hedrick from West Virginia, Mr. Horan from Washington, Dr. Miller from Nebraska, and Mr. McDonough from California, and my home is Missouri. So, at least geographically speaking, the committee is representative, I think, of the country and of the various sections that produce a lot of the food for the country, and I think that we all have a mutual interest.

If there is nothing further, Mr. Kleinfeld, we will——

Mr. KLEINFELD. Nothing further.

Mr. JONES. The committee will stand adjourned and our next session will be in San Francisco.

(Whereupon, at 12 noon, the committee recessed to reconvene in San Francisco, Calif., at 9:30 a. m., November 20, 1951.)

CHEMICALS IN FOODS AND COSMETICS

TUESDAY, NOVEMBER 20, 1951

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE TO INVESTIGATE THE
USE OF CHEMICALS IN FOODS AND COSMETICS,
San Francisco, Calif.

The select committee met (pursuant to H. Res. 74 and H. Res. 447, 82d Cong., 1st sess.; continuing the investigation and study begun under authority of H. Res. 323, 81st Cong., 2d sess.) at 9:30 a. m., in room 309, Federal Building, San Francisco, Hon. E. H. Hedrick presiding.

Present: Representatives Hedrick of West Virginia, Jones of Missouri, Miller of Nebraska, McDonough of California, and Horan of Washington.

Also present: Vincent A. Kleinfeld, chief counsel, and Alvin L. Gottlieb, associate counsel.

Dr. HEDRICK. The committee will please come to order.

I am sure that everyone present has a general idea of the purpose of this committee. The thought, the idea of this committee was established several years ago by one of our colleagues from Wisconsin. He had done much work developing this idea, had made many speeches on this subject of chemicals in foods. That was Congressman Frank B. Keefe, of Wisconsin. He was the originator of the resolution that finally passed Congress setting up this committee to make a study of the effect of chemicals in foods.

This committee has held hearings in several important cities, including Chicago, numerous hearings in Washington, and has had some very important evidence which will be very beneficial in perfecting a law later on to control some of these chemicals.

It is a pleasure to be here in your city, and I appreciate your appearing before this committee.

Who is your first witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Epstein.

(The oath was administered by the chairman.)

TESTIMONY OF ERVIN EPSTEIN, M. D., OAKLAND, CALIF.

Mr. KLEINFELD. What is your position, Dr. Epstein?

Dr. EPSTEIN. Assistant clinical professor of dermatology at Stanford University.

Mr. KLEINFELD. Where did you receive your medical degree?

Dr. EPSTEIN. The University of California.

Mr. KLEINFELD. What year?

Dr. EPSTEIN. 1935.

Mr. KLEINFELD. What have you been doing since that time?

Dr. EPSTEIN. I practiced in Oakland since 1937 and was in the Army for 3 years and I hold a number of positions. I am coeditor of the International Journal of Dermatology and consultant for the Veterans' Administration.

Mr. KLEINFELD. How long have you been specializing in dermatology?

Dr. EPSTEIN. Sixteen years.

Mr. KLEINFELD. Do you belong to any professional societies?

Dr. EPSTEIN. Yes. The American Academy of Dermatology, the Society for Investigative Dermatology, the Pacific Dermatological Association, the San Francisco Dermatological Society, the American Medical Association, the California Medical Association, and so on.

Mr. KLEINFELD. Have you contributed papers in the field of dermatology to various professional publications?

Dr. EPSTEIN. Yes; I have had about 55 papers accepted and a textbook on the diagnosis of skin diseases.

Mr. KLEINFELD. In your practice as a dermatologist, have you come in contact with patients who have had conditions resulting from the use of cosmetics?

Dr. EPSTEIN. Yes.

Mr. KLEINFELD. Will you please read your statement, sir?

Dr. EPSTEIN. Cosmetics are composed of chemical compounds, many of which have the power to do harm. While such chemicals can be absorbed through the skin and cause internal derangements, this is seldom the case. For the most part, they cause difficulty by adverse reactions on the skin and/or appendages. Such reactions may result from hypersensitivity—allergy—or by being primary irritants. In the former case the trouble results from an unusual reaction in the patient, while in the latter the chemical is too strong for use on any skin. For instance, nitric acid in the proper concentration is capable of burning any skin and is therefore a primary irritant. On the other hand, nail polish seldom causes reactions and therefore reactions to this complex chemical substance is on the basis of individual hypersensitivity.

One would think that most cosmetic manufacturers are intelligent enough to avoid known primary irritants. Yet in their book on cosmetics and dermatitis, Schwartz and Peck list 135 substances used in cosmetics that are capable of causing dermatitis and classify 54 of them as being primary irritants. Many companies do not properly test their product to establish that it is innocuous before marketing it. We have repeatedly seen new products offered to the public without proper proof that they were not dangerous. Not too uncommonly, they have proved to be anything but harmless.

Several years ago a number of cosmetic manufacturers brought out a new type of product that was applied under nail polish to make it adhere better. Chemically it was an excellent product. It was marketed under a number of trade names. Apparently the manufacturer had tested 200 women to this product before releasing it and found no evidence that it was either a primary irritant or that it contained any sensitizing agents.

However, about 6 months after it was placed on the market, a number of cases occurred of severe dermatitis under the nails accompanied by changes in the nails. These increased rapidly in number and soon a number of civil suits were filed against the manufacturers.

I investigated the problem by the following means. Fifty-two women who had never used such products were patch-tested to four of these products. In two patients very strongly positive reactions were obtained to all four products.

A questionnaire was sent to 118 dermatologists in the State of California. Over 90 percent replied. While many of the physicians had seen no such cases, 1 reported as many as 24 cases. All together, records of several hundred cases were obtained by this method.

Now, the question is, could all of this trouble have been avoided? In my opinion, the answer is "Yes." The suffering and embarrassment caused by the widespread use of this product could have been avoided if a strict law controlled the release of such cosmetics. It is difficult to conceive that the manufacturer could have actually done over 200 patch tests without finding any positive reactions when I found approximately 4 percent.

However, this suggests the first requirement. Enough patch tests should be performed—at least 500—to eliminate the possibility of missing a significant number of reactors in the normal population. Secondly, since many chemicals sensitize people on repeated contact, these tests should be repeated at monthly intervals for at least 6 months. The testing should be done and interpreted by someone experienced in this type of testing. It is not so simple to properly read these reactions. A possible suggestion would be to demand that these tests be done by and interpreted by a diplomate of the American Board of Dermatology and Syphilology or Allergy. However, it should be remembered, that these tests are not infallible and further studies must be done.

The cosmetic should be used, as recommended by the manufacturer, in a group of volunteers for at least 6 months before it is put on the market. After all, this is the crucial test. Such a plan might sound expensive to the manufacturer. However, it would be much cheaper than even one good-sized lawsuit. It would postpone the opportunity of the manufacturer to capitalize on his new product but would safeguard both the public and the manufacturer's reputation.

Another aspect to consider is the protection of the consumer against herself. Women often take chances when they know that a product is dangerous if it is cosmetically advantageous. For instance, it has been shown repeatedly that the paraphenylenediamine dyes are dangerous. This has been publicized widely. Yet it is virtually impossible to stop a prematurely gray woman, or even one who is old enough to have gray hair, from repeatedly dyeing her hair.

Some 10 years ago we had a large epidemic of dermatitis of the eyelids due to nail polish. Yet I have been told by women that they would rather go naked than give up nail polish. When the nail polish undercoat that I mentioned previously was taken off the market, many women rushed from store to store buying all they could so that they could continue its use. Therefore, I do not believe that the desires of the consumer should be given too much consideration, in any pending legislation of this type. Cosmetic acceptance should not be considered synonymous with safety.

Just how silly a woman can be when seeking artificial beauty is illustrated by the following case. A "golden blonde" decided that she wanted to be a "platinum blonde." She went to a beauty parlor

and a sample of her hair was tested against a solution. It was found that this sample responded well to the solution so it was put all over her hair. It worked rather well transforming all of her hair to a platinum blonde hue except for the front portion. This, unfortunately, assumed a brilliant purple hue. So instead of quitting when she was ahead, she returned to the same salon that assured her that this sometimes happened but could be corrected. She returned again to the same parlor and another solution was put on the hair. This eliminated the purple color all right but now the entire hair turned a brilliant green. The owner of the shop was a little upset about this but assured her that all would still be well. So again she placed her head in the lion's mouth, so to speak. Another solution was applied to her now green hair. This time the hair came out a heterogeneous mess of green, purple, platinum, and gold. By the time I saw her, her hair was growing out and was quite black at the roots.

If we are to safeguard the Nation's health, at least that of the distaff side of the Nation, the fact that a product or chemical is an effective attractive cosmetic, should not sway us in eliminating the dangerous substances from the cosmetic counter and beauty parlor.

Another cosmetic causing a great deal of current trouble for the dermatologists are the so-called cold waves. Not only do these products cause severe dematitis on the scalp, face, and neck of susceptible individuals but they can actually cause the hair to become weakened and break. This is believed to be due to the thioglycolates used as reducing substances. The latter effect requires months to eradicate. The manufacturers should realize by now that there is no wrath like that displayed by a woman temporarily shorn of her crowning glory. I now have five patients under my care who are engaged in litigation or contemplating such action because of hair damaged by cold waves.

While it is true that any substance can cause an idiosyncratic reaction, some do it more often than others. For instance, the reaction to poison oak is on an allergic basis. This is established by the following facts: Not everyone reacts to this plant; patch tests are positive in susceptible individuals but not in normal controls; the reaction does not appear immediately after exposure but requires an incubation period to become manifest; and desensitization, therapeutic or spontaneous, may occur. Now, even though this reaction is one of hypersensitization, it would be foolhardy for a florist to make a floral piece including the beautiful red leaves of this plant. This is true because sensitization to poison oak is common. On this basis it would be advisable to specifically ban certain chemicals that are primary irritants or common sensitizers from cosmetic manufacture. The fact that a reaction is on the basis of hypersensitivity should not be a legal defense against lawsuits or a moral defense against public opinion if this hypersensitivity occurs in an excessive percentage of consumers. On such a basis certain known sensitizers, including paraphenylenediamine, for example, could be excluded, from cosmetics.

In our thinking we should not minimize the importance of a dermatitis as against systemic poisoning and possible death. The dermatitis following the use of a poorly tolerated cosmetic may be disfiguring and slow to heal. Also, it is certain to be uncomfortable. Anyone who has suffered from a severe itching eruption can readily appre-

ciate the importance of such a complication. Morbidity without mortality should be given proper consideration.

In many ways, laws are needed to protect the public against dangerous cosmetics as much as against dangerous drugs. While the latter are more apt to cause death than is a cosmetic, the suffering from the beauty aid may be considerable. Considering the amount of cosmetics used and the number of individuals using them, the problem is important. On the whole, the cosmetic manufacturer knows less about toxicology and allergy than does the drug manufacturer. He is much less apt to do research and to test his product before offering it to the public. "Fly by night" manufacturers need the control more than the established companies, but the latter are not always perfect, either. Therefore, I feel that the cosmetic industry needs controls as much as the drug industry. A law making it necessary for the cosmetic producer to prove the innocuousness of his product before placing it on the open market would be of great public benefit and, in the long run, would benefit the cosmetic industry and the ethical manufacturer of cosmetics.

Dr. HEDRICK. That concludes your statement, Doctor?

Dr. EPSTEIN. Yes.

Dr. HEDRICK. Do you want to interrogate, Mr. Kleinfeld?

Mr. KLEINFELD. I will wait for the members.

Dr. HEDRICK. Any questions?

Mr. JONES. Yes; I have.

In this statement, Doctor, you mention the figure of 4 percent on these reactions. Do you think that it would be practical to exclude a cosmetic from the market because it had an unfavorable reaction on 4 percent of the people who used it?

Dr. EPSTEIN. I think that is a very high percentage; yes.

Mr. JONES. I mean, in your experience, is it not a fact that so many of us are subject to allergies that it would be practically impossible to find any cosmetic which would produce the result that women apparently seek in buying the cosmetic if we would try to limit it to one that would cause no reaction?

Dr. EPSTEIN. I think it would be impossible to find one that would cause no reaction. But I think that a reasonable figure for a cosmetic would be closer to about one-tenth of 1 percent. In other words, just because a person is called allergic does not mean that he will react to everything or to very many things.

If I may go a little bit afield, I would like to give you an example of what I mean by this. Many people who have eczema, which we call atopic dermatitis or neurodermatitis, they are all the same, are supposed to be very "allergic," or supposed to be among the more allergic people, as we know it.

As many of you know, there was a condition encountered during World War II in New Guinea and some of the places near there commonly called jungle rot. It was felt that whatever was causing this condition would certainly be more active in allergic people because it seemed to be on the basis of hypersensitivity. Yet we saw case after case that went into New Guinea with eczema, and after they were there, the dermatitis subsided, and when they left New Guinea it recurred again. Just because a person is allergic does not mean that he is allergic to everything.

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Mr. JONES. In connection with hair dye, you talk about a woman experiencing a certain reaction. Doesn't the average woman know when she uses hair dye or coloring that she is subjecting herself to a certain hazard there? Is that not common knowledge, but she is willing to go ahead anyway and take a chance on the possibility that she may obtain the particular color that she is looking for?

Dr. EPSTEIN. I think that is quite true. But the point that I made was that we cannot trust people's judgment. I think as we protect them from taking certain dangerous drugs, we should protect them against being exposed to certain cosmetics.

Mr. JONES. Let me ask you this, then: Did this change that occurred in the hair affect the person, you might say, physically or do anything to cause her discomfort other than the mental torture of seeing that, or did it shorten her life in any way or anything like that? the skin?

Dr. EPSTEIN. No. I think that if you can separate the mental anguish from the physical anguish, I would say you were perfectly right. But it is not so simple. I mean organisms are composed of both mental and physical sides and they tie in together. I can assure you that she was a very unhappy woman, and there was a very uphappy beauty parlor that had a large lawsuit against it.

Mr. JONES. Of course, that may be a matter of opinion, but I think you state that this woman went in there with her eyes open; she knew some of the hazards she was subjecting herself to. Yet she was willing to do that.

Dr. EPSTEIN. Yes; that is very true.

Mr. JONES. You would still say we ought to regulate an industry which would bring about this condition that you have mentioned here, although it did no physical bodily harm?

Dr. EPSTEIN. Cosmetics very often do physical bodily harm. It is not too uncommon for us to see dermatitis from hair dyes. In this particular case all there was was mental anguish. Hair dye is a common cause of dermatitis of the ears, scalp, face, and neck.

Mr. JONES. In this case she didn't get dermatitis?

Dr. EPSTEIN. No; she just had the mental anguish.

Mr. JONES. Just the mental anguish?

Dr. EPSTEIN. Yes.

Mr. JONES. Then it is safe to say she went into it with her eyes open?

Dr. EPSTEIN. Yes, just like other women who went out and bought this nail base coat that they used under their nail polish, they too bought it with their eyes open.

Mr. JONES. Even after they knew it was taken off the market they went out and got it because they were afraid they might not get it again, and they were willing to risk that.

Dr. EPSTEIN. That is right.

Mr. JONES. Is it not true a lot of what I would class as our more reliable cosmetic manufacturers put out products which we must admit do some good?

I am speaking particularly of hand lotions that do some good for most people, and yet there would be a small percentage of people who are allergic to something in that.

Dr. EPSTEIN. That is right.

Mr. JONES. I am speaking of a thing I have been rather intimate with. In fact, my wife cannot use one of the better known hand lotions which I know that millions of women do use. It is a nationally advertised product. But something in her makeup is such that she cannot use that particular brand. Do you think that because my wife cannot use it, it should be excluded from other people using it?

Dr. EPSTEIN. Maybe I did not make myself clear. I said earlier that you would never find a cosmetic—in fact, you said it and I agreed with you—you would never find a cosmetic for which you could not find someone who was allergic to it. However, I think that the percentage of reactions during the test period that I suggested should run closer to one-tenth of 1 percent.

Mr. JONES. One-tenth of 1 percent?

Dr. EPSTEIN. In other words, maybe one in a thousand or even less than that.

Mr. JONES. You suggested testing, I believe—how many?

Dr. EPSTEIN. Five hundred.

Mr. JONES. And then one-tenth of 1 percent, you would get one reacter there, and that would be enough to exclude that from the market; is that right?

Dr. EPSTEIN. I think under those circumstances you would probably have to do more testing. But if you get 500 negatives, I think you are reasonably safe in putting it on the market. If you get one reacter, I think further testing should be done. You cannot establish a hard and fast rule and say that is the end of it. If the results are indeterminate, I think that you have to study the problem further.

Dr. HEDRICK. What is your opinion about estrogenic hormones in face creams?

Dr. EPSTEIN. I have never seen any value from them nor have I seen any particular harm. I know they are supposed to be harmful, but I have done no particular work on this phase and have no particular experience with it.

Dr. HEDRICK. You see no contra-indication of the use of it?

Dr. EPSTEIN. I see no contra-indication. I think investigators who have made a definite study of the question could answer that better than I could.

Dr. HEDRICK. Dr. Miller, do you have any questions?

Dr. MILLER. I appreciate the doctor's statement. He is an eminent dermatologist and he has given us cases from his experience. I was going to follow a little further on the first sentence of your statement:

> **Cosmetics are composed of chemical compounds, many of which have the power to harm. While such chemicals can be absorbed through the skin and cause internal derangements, this is seldom the case.**

Do you know what chemicals might be absorbed through the skin, if any?

Dr. EPSTEIN. They used to use mercury in some cosmetics. Of course you do not run into this any more. However, formerly we had trouble with this metal; I believe the paraphenylenediamine dyes can also be absorbed, and certainly others can be absorbed. I do not know of any cases offhand.

Dr. MILLER. What about hormones—can they be absorbed through the skin?

Dr. EPSTEIN. Yes; we know that. We use this therapeutically.

Dr. MILLER. One of our witnesses in Washington spoke about some rather dramatic experiments with hormones on baboons and the results that he had obtained. Cold creams that can give sort of the blush of youth to individuals who are getting over on the shady side of life in age—I mean wrinkles around their eyes—if it did not do any harm, of course, it would be quite a moral lift to those people if they could still look young during their declining years. You wouldn't object to that; would you?

Dr. EPSTEIN. I think it would be a question of dosage. If a person were absorbing enough estrogenic substance to cause menstrual irregularity and disturbances in the breasts, I would object to it.

Dr. MILLER. We are speaking about idiosyncrasies. There are as many, of course, as people as live. I can't tolerate tuna fish and sulfa drugs, and other people can. The same would be true of some toothpastes, which cause certain reactions. In your experience do you find people with hay fever or asthma would have more reactions or idiosyncrasies to cosmetics than other people?

Dr. EPSTEIN. That statement is commonly made, but I think it is a fallacy. Certainly in my experience it is not true.

Dr. MILER. You speak of Schwartz and Peck. Who are they? What is their background?

Dr. EPSTEIN. They have written several books. Schwartz has written a book on occupational dermatosis, and Peck has been coauthor of three books. Peck is a dermatologist in New York and Schwartz was head of the dermatological section of the United States Public Health Service for many years. I think he is now in private practice in Washington. They are recognized as outstanding authorities on this subject.

Dr. MILLER. You also say:

> We have repeatedly seen new products offered to the public without proper proof that they were not dangerous. Not too uncommonly, they have proved to be anything but harmless.

Would you care to name any of those products?

Dr. EPSTEIN. Besides the ones I have mentioned already, of course, about 6 years or 7 years ago we had quite an epidemic of dermatitis due to hair lacquer. Constantly new products are being brought out, and from time to time we do run into trouble from them.

Dr. MILLER. Do you know anything about the formula of Perma-Nail?

Dr. EPSTEIN. Well, I used to know. It has a plasticizer, and I think it has bakelite in it, if I am not mistaken. I am not positive, but I think it has acetone in it. That was one of the substances I was talking about when I was speaking about the nail polish undercoats.

Dr. MILLER. If a person gets a reaction to one type of nail polish or hair dye, the trial-and-error method ought to tell them not to use it again, I suppose.

Dr. EPSTEIN. If they recognize it.

Dr. MILLER. If they recognize it?

Dr. EPSTEIN. Yes.

Mr. JONES. Pardon me, Doctor.

Dr. MILLER. Yes.

Mr. JONES. This acetone, is it not rather common practice for women to go to the drug store and buy it and use for nail polish remover?

Dr. EPSTEIN. Yes.

Mr. JONES. There is nothing to prevent the drug store from selling acetone?

Dr. EPSTEIN. No, but the acetone was not the dangerous substance in this particular product. It is not what caused the trouble.

Mr. JONES. I see. Thank you.

Dr. MILLER. The committee, of course, will be interested when the hearings are through about recommending legislation. As a committee we do not write the legislation but will probably make recommendations to a standing committee. I am wondering if you would have any concrete suggestion as to the type of legislation that we ought to recommend to the standing committee.

Dr. EPSTEIN. I think that the only recommendation I would make or suggest would be that something definite should be established as to what a manufacturer had to do before he could sell his produce—just as the drug manufacturer has to put up his product for research for a certain length of time before he sells it. There have to be reports made, I believe, to the Government about it. I think something along those lines should be done.

Dr. MILLER. Do you think the burden of proof ought to be upon the company that wants to put out a new cosmetic or a nail polish, to determine whether it is harmful or not?

Dr. EPSTEIN. I think it should be. I do not know who else could be responsible for furnishing this proof.

Dr. MILLER. Then who would be the judge as to the findings? Would you let some Government agency who enforces the law be the judge, or would you turn that over to a competent board of some kind?

Dr. EPSTEIN. Well, how is it done with drugs? The drug companies have to investigate their new products before they can market them.

Dr. MILLER. I am asking you, do you think the bureaucrats in Washington ought to be both the judge and the executioner?

Dr. EPSTEIN. The ideal method would be a committee composed of doctors, established by the American Medical Association, and a group of dermatologic societies, allergy societies, etc. Obviously it should be in the hands of some type of a medical organization.

Dr. MILLER. In your opinion the large group of people now making cosmetics hew pretty close to the line in trying to get something that is not harmful and will do the most good for the individual without complaints?

Dr. EPSTEIN. I think that they do in a general way, you might say, for self protection. But, as I understand it, and I could be wrong about it, anybody can start manufacturing cosmetics. We have seen many times when somebody—I won't say many times—but we have seen times where somebody has started manufacturing cosmetics in their basement, getting a label printed, and being in business.

Dr. MILLER. You think those people need regulation?

Dr. EPSTEIN. I think they need regulation more than the ethical manufacturer.

Dr. MILLER. The florist that sells flowers, if he starts putting a little poison oak and poison ivy in every bouquet, would probably feel it in a business way.

Dr. EPSTEIN. They would have done a great deal of damage in the meantime.

Dr. MILLER. On the Nile, I believe, they used to put an asp in ladies' bouquets when they wanted to get even with some rival. I guess that is not done any more unless they are put in unknowingly.

I think Cleopatra was the first "gal" that thought about cosmetics or fixing herself up. She rolled herself up in a carpet and perfume and Mark Anthony's interest was aroused and she got by with it. She was the first artist and the first dispenser of cosmetics. So we are dealing with a very, very old subject, Doctor, and I am rather partial, I must say, to the cosmetic group, Doctor.

I am a physician, too, a Fellow of the American College of Surgeons. But anything that will make me look a little younger is all right.

A few years ago when I was a kid they never wore any nail polish, didn't have any hair-do, didn't have any lipsticks. I think it is a great morale booster now, and I think you and I ought to sort of encourage that industry. But we ought to say, "You should not use anything that causes reaction in too many people."

Mr. HORAN. Will the gentleman yield?

Dr. MILLER. Yes.

Mr. HORAN. Did they not enamel their faces one time about 50 years ago?

Dr. EPSTEIN. I do not know.

Mr. HORAN. Yes; they did.

Mr. JONES. Enamel?

Mr. HORAN. I don't remember what it was.

Dr. MILLER. I think we have made progress, and I am inclined to agree with the doctor that always in the field of competition there are those who get on sort of the edge of the competitive field, and because of the question of economics they probably cut corners and do some things in the basement, as you say, that would not be in the best interest of the public. This committee is interested in what is best for the majority of the public, and I think maybe when we get through we will have had some little idea of those things.

Thank you very much, Doctor.

Mr. KLEINFELD. Doctor, as the present law now stands, the Federal Food, Drug, and Cosmetic Act, before a drug manufacturer may distribute his product in interstate commerce his labels must set forth the names of the active ingredients. Similarly, before a food manufacturer may distribute his products in interstate commerce, his labels with respect to unstandardized foods must set forth the common or usual names of the ingredients.

The law, as it refers to cosmetics, does not require the cosmetic manufacturer to set forth on his label the names of the ingredients contained in his products. From the viewpoint of both the dermatologist and the consumer do you think it would be a wise requirement that a cosmetic manufacturer set forth on his label the names of the ingredients contained in his products?

Dr. EPSTEIN. I would think so.

Mr. KLEINFELD. Would that give some opportunity to the consumer to determine what is in the cosmetics she is purchasing so there would be a possibility, at least, of avoiding those which she might know, or might learn, would cause adverse reactions?

Dr. EPSTEIN. I think that is true.

Mr. HORAN. Will counsel yield there?

Mr. KLEINFELD. Yes.

Mr. HORAN. I think we ought to go further into that, because I think we ought to differentiate between what is a poison, Mr. Kleinfeld, and what might cause allergies.

I imagine Dr. Epstein—and you are an expert witness—will understand what I am getting at. If it is poison, on the label we can put a skull and crossbones, but we cannot necessarily put all of the numerous instances that might cause allergies with individuals. So our problem is a little deeper than just putting it on the label. I am not trying to detract from your question, which I think is very valid, but I wonder what the doctor feels about that.

Dr. EPSTEIN. In answer to those two questions, there are really two things to consider. I think the main value is, for instance, if persons knew they were allergic to a given chemical, say paraphenylenediamine, and saw that this was contained in a hair dye, they would not use it.

The weakness is the question of strength and the percentage of the ingredient is not stated on the label. Very often one person might be able to stand 1 percent of a chemical and not 10 percent. So it is of limited value but it would be of some help.

Mr. HORAN. Thank you.

Mr. MCDONOUGH. Mr. Chairman.

Dr. Epstein, is there any requirement in the California law controlling or regulating the ingredients used in cosmetics?

Dr. EPSTEIN. I could not really answer that because I do not know what the law is. I can only say as far as I know there is not, but that would not make it so.

Mr. MCDONOUGH. I did not hear you.

Dr. EPSTEIN. I say I can only answer that, as far as I know there is not, but I do not know for sure one way or the other.

Mr. MCDONOUGH. I see. In other words, you don't know whether there is a State regulation or statute or anything of the sort in the State of California or any other State in the Union you are familiar with?

Dr. EPSTEIN. I do not know.

Mr. MCDONOUGH. What are the basic ingredients for most creams that are used, cosmetic creams? Are there a large variety or a limited variety?

Dr. EPSTEIN. There is quite a large variety. An ordinary cream would be composed of 8 or 10 different chemicals. I mean just the base creams. They make all kinds of modifications of that. In our practice of dermatology we use similar bases for treatment to put medicines in, and there is quite a variety of them.

Mr. MCDONOUGH. Well, lanolin seems to be one of the bases used in a great number of cosmetics here lately. I see it on the shelves. Has that been commonly used over a long period of time or is it just coming into use?

Dr. EPSTEIN. Lanolin is a very old product and has been used for many years. But cosmetic manufacturers do not use lanolin itself. Lanolin is a semisolid that is not cosmetically acceptable. They use a little lanolin and mix a lot of other substances with it. They say, "It contains lanolin."

Mr. McDonough. You mean lanolin is the vehicle that the other materials are combined with in order to make cosmetic creams?

Dr. Epstein. As I understand it, it is more of a catch advertising phrase, that it contains lanolin, but the amount of lanolin in it is small, I would say.

Mr. McDonough. Lanolin, we know, is fat from sheep wool.

Dr. Epstein. That is right.

Mr. McDonough. Are you familiar with any one of the processes used to refine it from the raw material to its use as a cosmetic?

Dr. Epstein. No, I am not.

Mr. McDonough. I am speaking from a little personal experience with a hair tonic which contained lanolin, which I thought I became allergic to. It gave me quite a dose of dermatitis. I am wondering if you knew anything about the refining of it to the point where it could be used. I imagine in its raw state it would be rather detrimental to the average skin.

Dr. Epstein. Well, it is certainly not cosmetically acceptable in its raw state or even in the state in which we get it in the Pharmacopoeia.

Mr. McDonough. Are you familiar with the manufacture of lipstick?

Dr. Epstein. Not very much, no.

Mr. McDonough. Do you know of any lipsticks that have poisonous material in them that are detrimental to the user?

Dr. Epstein. If you say poisonous material, I would say "No." If you say sentitizers, I would say "Yes."

Mr. McDonough. Some lipsticks contain mercurochrome, don't they?

Dr. Epstein. I do not know. I have never heard of any that did, but I would not say that they could not.

Mr. McDonough. Most of them contain a dye of some sort.

Dr. Epstein. That is right.

Mr. McDonough. And do you know whether it is a vegetable dye or it is an inorganic dye?

Dr. Epstein. I think most of them, if I am not mistaken, are analine dyes.

Mr. McDonough. Analine dyes?

Dr. Epstein. Yes. But they are not mercurials, more like mercurochrome, to the best of my knowledge.

Mr. McDonough. Is mercurochrome used now in lipsticks or has that been discontinued, do you know?

Dr. Epstein. I have not heard of it being used in lipsticks.

Mr. McDonough. Do you think, insofar as the regulation of the component parts of cosmetics is concerned, whether it be liquid or cream or in any other form, that it should be incorporated in Federal law, or should it be designated in State law?

Dr. Epstein. I think that is a legal problem that I could not answer. From my own standpoint, as a matter of opinion, I think it would be better to have a Federal law because these manufactured articles are being used in all States, and certainly it would be less confusing and better for the manufacturer if he knew what he could do and what he could not do for the whole country, instead of just for a small area.

Mr. McDonough. In your opinion, do you think cosmetics are of any value outside of beautifying the individual, making them look better and cleaner? Is there any physical benefit derived from them?

Dr. EPSTEIN. From some cosmetics. Some cosmetics, for instance, are protection against sun, which is of physical benefit. Some of them lubricate the skin and overcome dryness of the skin. I would say that was physical benefit.

Mr. MCDONOUGH. Do you think most of them, then, give some physical benefit?

Dr. EPSTEIN. No; I would say some of them. Most of them are of no physical benefit.

Mr. MCDONOUGH. But merely serve the purpose of beautifying the individual?

Dr. EPSTEIN. That is right. Some of them are of physical benefit. But I think those are comparatively few in number.

Mr. MCDONOUGH. As you know, this committee is investigating the use of chemicals in insecticides and fertilizers. The State of California is an exemplary State insofar as the ingredients of poisonous materials in fertilizers and insecticides. Do you think it is just as important for the State of California, for the Federal Government, to pass legislation to regulate the ingredients of cosmetics as well as of fertilizers and insecticides?

Dr. EPSTEIN. When you say "just as important," you are making a comparison?

Mr. MCDONOUGH. Yes.

Dr. EPSTEIN. In spite of what I have said, naturally, a death is more important than discomfort, but they are both important. I think it is important to pass legislation, but whether it is more important, I think, would be a matter of opinion. I think most of the evidence would point to the fact that the regulation of poisons is more important than the regulation of allergies.

Mr. MCDONOUGH. That is all.

Dr. HEDRICK. Doctor, we thank you very much for your excellent statement. It will be of a lot of benefit to us, I am sure.

Dr. EPSTEIN. Thank you.

Dr. HEDRICK. Who is the next witness?

Mr. KLEINFELD. Dr. Allington.

(The oath was administered by the chairman.)

TESTIMONY OF H. V. ALLINGTON, M. D., OAKLAND, CALIF.

Mr. KLEINFELD. State your name and address, please.

Dr. ALLINGTON. H. V. Allington, 3115 Webster Street.

Mr. KLEINFELD. What is your academic background?

Dr. ALLINGTON. I had 3 years of premedical education at the University of California at Los Angeles, 4 years medical school work at the University of California, Berkeley and San Francisco, internship at Alameda County Hospital, 2 years of graduate study in skin diseases in New York as associate of Dr. George M. MacKee and teaching as clinical assistant in the New York Post Graduate Medical School, dermatological department. I then worked with Drs. Morrow, Miller, and Taussig here in San Francisco, and on the staff of the dermatological department at the University of California Medical School for about 8 months.

Since that time I have been in private practice in Oakland, Calif.

Mr. KLEINFELD. How long have you specialized in the field of dermatology?

Dr. ALLINGTON. Since 1931. At least I began my special training in dermatology in 1931.

Mr. KLEINFELD. What professional societies do you belong to?

Dr. ALLINGTON. The local Alameda County Medical Society, the California State Medical Association, the American Medical Association, the San Francisco Dermatological Society, the Pacific Dermatological Association, the Society for Investigative Dermatology, the American Academy of Dermatology and Syphilology, the American Dermatological Association——

Mr. KLEINFELD. That is enough. Have you contributed papers in the field of dermatology to various professional publications?

Dr. ALLINGTON. Yes, sir.

Mr. KLEINFELD. About how many would you say, roughly?

Dr. ALLINGTON. Perhaps 15.

Mr. KLEINFELD. And in your practice as a dermatologist, have you come into contact with patients who have suffered consequences as a result of the use of cosmetics?

Dr. ALLINGTON. Yes, sir.

Mr. KLEINFELD. Will you please read your statement?

Dr. ALLINGTON. We all know that the use of cosmetics is extremely common. The sale of cosmetics is in every sense of the word big business. Considering the tremendous number of cosmetic preparations on the market, and the fact that they are used so widely, the incidence of untoward reactions from their use is relatively low. However, injury from the use of cosmetics is a definite problem and will continue to be so.

Cosmetics may be harmful in more than one way. It is possible for them to contain materials which are directly irritating to the average skin. Examples of this would be the use of salicylic acid in bleaching creams in such strength that it would cause burning or in prolonged use cause undue dryness, chapping and peeling, or the use of strongly alkaline preparations such as ammonium thioglycolate which is used in cold waving. Unless the strength of these and similar preparations is controlled they may harm by their direct caustic action. Another, and perhaps the more common way in which cosmetics can be irritating, is through their tendency to cause sensitization or allergic reactions. There are few substances to which someone cannot be allergic. Some materials are rarely sensitizing, whereas others are commonly sensitizers. This is true of chemicals used in cosmetic preparations just as it is true of plants. We all know that there are many plants which are innocuous to most of us and remain so throughout prolonged contact, whereas there are certain plants, notably poison oak and primrose, which on repeated contact cause sensitization in the majority of individuals.

In the past there have been many examples of dermatitis as the result of using cosmetics. I shall attempt to name only a few. Hair dyes, hair rinses, and color hair shampoos have been fairly commonly the cause of trouble. Paraphenylenediamine, which is the base of a number of dyes, when used indiscriminately in the past, has caused a great deal of difficulty because it is one of those preparations which has a high sensitizing potential. Nail polishes, because of sensitization to dyes, resins, and plastics from which they are made, have been fairly common causes of dermatitis. Perfumes have caused a great deal of difficulty. In times past, perfumes have been made of chem-

icals, some of them derivatives of coal tar, which were common sensitizers and, also, commonly caused the skin to become sensitive to sunlight (photosensitization). This has resulted both in dermatitis and in pigmentation. A classical example of this is the Berlocque dermatitis due to the application of photosensitizing perfume to the sides of the neck below the ears, resulting in irritation and subsequent pigmentation on exposure to light. Such perfumes, when used in powders and creams, have also caused skin irritation.

Hair lacquers and wave-set lotions have been the source of difficulty. Lipsticks, both because of the dyes which they contain and because of other ingredients in their bases, have in the past caused very frequent difficulty. Some of these dyes have caused difficulty through their photo-sensitizing potential. Hair tonics have been a source of a considerable amount of difficulty because a wide variety of chemicals, including pilocarpine, betanaphthol, resorcin, quinine, and other commonly irritating and sensitizing materials have been included in their formulas.

Depilatories normally contain potentially irritating materials in that they are designed to soften keratin. They have in the past given rise to irritation on numerous occasions. The same is true of antiperspirants and deordorants. More recently, permanent-wave solutions used in the so-called cold-wave process have fairly commonly been the cause of determatitis. Ammonium thioglycolate and thioglycerol are the materials most commonly used in cold waving and have a fairly high sensitizing potential as well as being potential direct irritants.

An unusual cause of skin irritation, and yet one illustrative of the care that may be required to avoid trouble, was a minor epidemic of irritation of the eyelids due to eyelash curlers. The eyelash curler was a pincerlike instrument with the jaws covered with synthetic rubber. The synthetic rubber used apparently contained a common skin sensitizer and sensitization dermatitis of the eyelids resulted from its use.

It is undoubtedly true that since 1938 when the present Pure Food, Drug, and Cosmetic Act was adopted, there have been fewer cases of irritation from the use of cosmetics. However, this act has not solved the problem completely by any means. Within the last 10 years we have seen a fairly extensive epidemic of dermatitis from the use of a hair lacquer containing an irritant synthetic resin. Likewise, recently there were many cases of dermatitis, dystrophy, and even temporary loss of the nails due to a type of long-lasting nail polish—the so-called base coats—due to synthetic rubber and a phenolic resin which they contained. During this period we have seen a number of cases of lipstick dermatitis due to the so-called permanent or "kissproof" lipsticks which contain an indelible bromfluorescin dye.

Although it is undoubtedly to the interest of the manufacturers to avoid numerous cases of skin irritation such as resulted from use of these preparations, still manufacturing and marketing procedures and the pressure of competition apparently make it possible for cosmetic preparations to be released for general use before they have been proven safe. It is my understanding that the present Pure Food, Drug, and Cosmetic Act requires that a cosmetic preparation be proven to contain a poisonous or deleterious substance before it can be ex-

cluded from the market. This may be a difficult procedure, at times, in order to comply with usual court procedure, and considerable time may be lost in excluding a material from use even though good evidence exists that it may be potentially harmful.

It is obvious, then, that a problem exists and that present laws and procedure are inadequate. In each of the three examples just offered, namely, the epidemics of dermatitis resulting from the use of hair lacquers, base-coat nail polish, and indelible lipstick—all of which have occurred since the present law was established—their common irritating qualities could have been discovered by adequate preliminary testing.

This preliminary testing should include both patch tests and actual use tests. The methods of patch testing are those which have been developed and described best by Dr. Louis Schwartz. He describes what he calls prophetic testing, in which a substance is applied to a number of individuals as a patch test and the number of reactions noted. Then, following a period of 10 days, the patch tests are repeated and again the number of reactions noted in an attempt to determine what percentage of individuals may have been sensitized by the previous patch test. It is necessary, of course, that these tests be applied properly and that proper controls be used. Following preliminary prophetic patch testing, if the preparation proves to be not directly irritating and if it shows a sufficiently low sensitizing potential, then it can be tried under actual conditions of use for an adequate period on a larger number of subjects to prove its safety.

It would seem to be unnecessary and would cause hardship and unjustified expense if it were required that every new cosmetic preparation be subjected to this type of test. If a preparation is composed of ingredients which have been used widely for years and which are known to be relatively innocuous, preliminary testing should not be required. However, pretesting should certainly be done on cosmetics containing new chemicals whose safety for use has not been established.

In summary, we could say that the use of cosmetics is so widespread as to be almost universal. Injury from the use of cosmetics is relatively uncommon but still constitutes a source of considerable annoyance, discomfort, and temporary disability. The present system of manufacture and sale and the present laws governing the distribution of cosmetics are inadequate to prevent occasional release of preparations capable of causing harm. Means of detecting potentially irritating cosmetic preparations are at hand. Their use would in many cases prevent the release and wide usage of irritating cosmetic preparations. Therefore, I believe that new legislation designed to require adequate preliminary testing of new cosmetic preparations is desirable.

Dr. HEDRICK. Does that conclude your statement?

Dr. ALLINGTON. Yes, sir.

Dr. HEDRICK. Mr. Jones.

Mr. JONES. You heard Dr. Epstein's statement that he thought that one-tenth of 1 percent would be a sufficient safety margin to use in excluding a drug from the market. Would you agree with that or would you think there should be a greater tolerance?

Dr. ALLINGTON. I don't believe I understand that.

Mr. JONES. In other words, Dr. Epstein said that it was his opinion that if one-tenth of 1 percent of the people tested showed themselves to be allergic to the cosmetic that it should be excluded. Would you

agree with that figure, or do you think that a cosmetic might prove to be allergic to a greater percentage of users and still be acceptable on the market?

Dr. ALLINGTON. That would be one in a thousand. I hesitate to set a figure.

Mr. JONES. I note toward the last here you say:

Following preliminary prophetic patch testing, if the preparation proves to be not directly irritating and if it shows a sufficiently low sensitizing potential.

How low would you want to put that, or could you set a figure on it?

Dr. ALLINGTON. I would rather not set a figure. I would rather leave that to a committee to determine.

Mr. JONES. You say to a committee. Who would you suggest should compose a committee to act on that?

Dr. ALLINGTON. I should think the committee should be composed of representatives from dermatologists and manufacturers and chemists who are particularly interested in this subject.

Mr. JONES. That is all.

Dr. HEDRICK. Doctor, about 60 days ago there was a shampoo removed from the market. I don't know whether you are familiar with it or not. It was only on the market about 30 days and caused a blurring of the cornea of the eye. Have you heard anything about that preparation?

Dr. ALLINGTON. I did; yes, sir. I heard about it in a letter from one of the cosmetic companies.

Dr. HEDRICK. It was only on the market about 30 days and several cases of blurring of the cornea resulted.

Dr. ALLINGTON. Yes.

Dr. HEDRICK. Of course, it was immediately taken off the market. If that preparation had been properly tested ahead of time it never would have happened.

Dr. ALLINGTON. Yes, sir. I think by proper use test that certainly could have been discovered before released for general use.

Dr. HEDRICK. That is right.

Dr. Miller, do you have any question?

Dr. MILLER. I just have one or two questions.

Dr. Allington has made a definite contribution to the committee on the effects of cosmetics. I am wondering, however, where we might draw the line between what we would ordinarily call cosmetic preparations and the things that might be used in the doctor's office. I am thinking now of some sort of salicylic acid to remove eczema or some scaly skin disease. Where do you draw the line between a cosmetic and what doctors might use to remove scaly conditions of dermatitis?

Dr. ALLINGTON. I think that when a doctor prescribes a preparation he does so for a specific condition which needs correction, and with presumably full knowledge of its potential dangers as well as its potential benefits. I think that is true when a physician prescribes for any purpose, whether it is for a skin disease or for an internal disease.

Dr. MILLER. A cosmetic operator would hardly tend to approach it from that angle.

Dr. ALLINGTON. That is right.

Dr. MILLER. There are a few operators though, who don't hesitate to use the electric needle to remove hair or even treat warts. I think some of them even use nitric acid on some of these warts. I have seen

a couple of them. I presume that would be outside of the field of cosmetics, though.

Dr. ALLINGTON. I should think so. I think that would be governed by regulations regarding the practice of medicine.

Dr. MILLER. You spoke about some of these creams being used for photogenic purposes. I believe with the advent of color television there are some creams available for the people in the act to use that make them appear a little more vivacious, acceptable to the public. Do you know anything about the creams they are using on the people for the color television screen?

Dr. ALLINGTON. No, sir; I don't know anything about that.

Dr. MILLER. You wouldn't know whether they would be cosmetics or not. I suppose that maybe they would come under a different branch.

Dr. ALLINGTON. Well, sir, I should think it would come under the regulation of cosmetics.

Dr. MILLER. You speak about the need of new legislation designed to require adequate preliminary testing of new cosmetic preparations being desirable. Would you care to give us a little information about the type of legislation that might be needed, or would you prefer to leave that to the legal professors?

Dr. ALLINGTON. Yes, I think I would rather do the latter.

Mr. MILLER. I think that is all.

Dr. HEDRICK. What is your opinion of estrogenic hormones in face creams, sir?

Dr. ALLINGTON. I think that if a person needs an estrogenic hormone it can be much more accurately and adequately given either orally or by injection than to attempt to supply it to the system through the skin, which is both uncertain and uneconomical and, in general, poor medicine.

Dr. HEDRICK. Women use creams, as I understand it, mostly because they have a tendency to take out the wrinkles and clear up the skin. They do not take it for systemic purposes; they take it for appearance of the skin. Do you know anything about that?

Dr. ALLINGTON. I doubt if it is of value to apply it in that fashion, and I think if anything could be accomplished in the correction of wrinkles or in any other way as an aid to the skin, it would be better done through either oral or hypodermic medication.

Dr. HEDRICK. Have you ever seen any ill effect of estrogenic hormone used in any way?

Dr. ALLINGTON. No. Excuse me; in creams, do you mean?

Dr. HEDRICK. In creams, or given hypodermically.

Dr. ALLINGTON. I have seen untoward reactions from its use both orally and from hypodermic application. I don't recall I have seen any through application in the form of creams.

Dr. MILLER. I want to ask another question along that line. The hormones are absorbed through the skin, though, Doctor?

Dr. ALLINGTON. Yes, sir; I believe they are.

Dr. MILLER. Do you know what percentage of them are absorbed?

Dr. ALLINGTON. I think that depends a great deal on the vehicle——

Dr. MILLER. If it is absorbed through the skin, it causes water accumulations under the skin. Is that the reaction you understand it produces?

Dr. ALLINGTON. I don't know exactly, sir.

Dr. MILLER. We had a gentleman who testified before our committee, Dr. Hartman. He testified about some experiments with some of these hormone creams on the tail end of a baboon, for instance, where they rubbed a little of the hormone cream over the raw surfaces and got a gallon of water under his skin, and it ballooned out, not only once, but time and time again. Or the use on nipples of rats. And they even tried it on human beings, on the nipple, and it caused a lot of fluid under the nipple or under the skin.

And it causes a lot of water under the skin. It produces fluid. If you got some crow's feet along the eyes and use some it produces fluid, and eliminates the wrinkles. You are not familiar with that?

Dr. ALLINGTON. No, sir; I am not familiar with that.

Dr. MILLER. It is rather interesting testimony, Doctor, as to the effects of hormones when used externally.

Dr. ALLINGTON. I am not familiar with it.

Dr. HEDRICK. Do you believe that hormones in any way would cause cancer?

Dr. ALLINGTON. That is a question about which there has been a great deal of discussion. I think that it is possible that under special circumstances they can either cause or aggravate it.

Dr. HEDRICK. Mr. Horan.

Mr. HORAN. You have dealt, of course, in the field of specific treatments of individuals. As a physician, studying a specific patient who might want to rejuvenate her skin, in some cases you might prescribe something that you knew might react another patient; isn't that true?

Dr. ALLINGTON. I am sorry, I didn't follow you clearly.

Mr. HORAN. I say that in the case of cosmetics, most of them are of a specific nature, and being specific and dealing entirely with that individual, it should be prescribed by somebody who knows what he is doing. Is that not true?

Dr. ALLINGTON. Considering the use to which——

Mr. HORAN. I am not trying to embarrass you at all. I think you are an excellent witness and very honest.

Dr. ALLINGTON. I am trying to understand, too. I should think if a cosmetic preparation had been shown to be relatively innocuous to the large majority of people, then it could be used indiscriminately.

Mr. HORAN. Sold over the counter, in other words?

Dr. ALLINGTON. Yes, sir.

Mr. HORAN. What I am getting at is simply this: This committee will recommend to the Congress the modification of existing laws or the implementation of new laws dealing with those things which are deleterious to public health either in the field of adulterants or residues on foods, or that which might be deleterious to health in cosmetics. In doing so we are going to have to review, probably, the whole field of how to determine whether or not it is deleterious, and in doing so, of course, we will have to make a decision between those things which are specific and those things which are general. And in doing so we will have to employ the facilities of the Government in those tests. Now, in the field of foods, which are necessities of life or essentials of life, in the fruit industry, which is so important to us out on the Pacific coast, we are employing already facilities of the Government to make preliminary tests or to follow up on the experience of materials already used.

In the field of cosmetics, should facilities be employed there, or should we make recommendations that the medical profession be called upon to use its own discretion in specific cases? Now the question is: Should we employ the full facilities of Government to determine whether or not a lipstick or a nail polish or a cold cream is deleterious to the public health prior to its use, or should that be left entirely to the industry?

Dr. ALLINGTON. Well, I don't consider myself an authority as to governmental procedure or legal procedures, but it would seem to me that the industry itself should prove that a preparation which it is putting on the market—that is, an individual manufacturer should prove to itself and to the satisfaction of some committee set up by the Government that a preparation is harmless to the public before it is released.

Now, the Government will have to set up some agency to control it, I suppose. I don't know how that is going to be done or how it should best be done. I think perhaps the Government should designate a committee, with representatives of the manufacturing group, chemists trained in that procedure, and physicians acquainted with the complications from the use of cosmetics, and that they should act as a board to judge the competence of tests performed by the manufacturers to determine that their product is relatively harmless.

Mr. HORAN. We have had a lot of difficulty even in the field of the reaction to the continued exposure to insecticides, pesticides, by human beings. We have the reactions to the use of human beings even in the determination of whether or not it is deleterious to the health of those individuals and consequently to the general public.

Of course, that brings into purview the reaction of the general public to whether or not we are going to test certain cosmetics on human beings. What is your reaction to that?

Dr. ALLINGTON. I think that any cosmetic preparation whose use is contemplated on large numbers of individuals should certainly be tested on a few first to determine whether or not they are direct irritants, for example. If it is proven that they are not direct irritants, then it should be determined both by further patch testing and by actual use tests whether or not their sensitizing potential is high. If it is sufficiently high, I think its use should be excluded.

Mr. HORAN. Do any boards or any agencies exist among the dermatologists, among the cosmetic manufacturers today?

Dr. ALLINGTON. As far as I know, it is a matter of individual responsibility on the part of the manufacturers, and I know of no dermatological board to supervise it.

Mr. HORAN. There is no organization in that field?

Dr. ALLINGTON. No; not so far as I know.

Mr. HORAN. That is all, Mr. Chairman.

Dr. HEDRICK. Mr. McDonough, any questions?

Mr. MCDONOUGH. Doctor, do you believe that the well-known, long-established cosmetic manufacturers are delivering a reliable product to the public that will not cause any particular amount of deleterious effect on human beings?

Dr. ALLINGTON. I think in general that is true, but I think there are exceptions. One exception that could be cited would be the trouble that arose from the use of so-called long-lasting or base-coat nail polish. A number of widely known, large companies usually deliver-

ing innocuous cosmetics were involved in that difficulty. Preparations of wide distribution by well-known manufacturers did cause trouble in this substance.

Mr. McDonough. You mean even by the reliable, long-established cosmetic manufacturers?

Dr. Allington. Yes, occasionally. It is quite the exception, but I think occasionally it still happens.

Mr. McDonough. In addition to the precaution that we might use if eventually we recommend legislation along the lines Mr. Horan just outlined—in addition to the precaution of being certain that the ingredients in the material will not be deleterious to any large number of people, do you think there should be any control of the advertised claims of cosmetics?

Now, I don't know of any commodity outside of, perhaps, the automobile industry, that appeals so much to the public as the cosmetic industry, as to what a cream will do. You take the automobile people. They claim that the next model is so superior to the one that was just on the market that you cannot get along without it. Now, the cosmetic people are inclined to be very elaborate in their claims of what cosmetics will do. Do you think that the reliable cosmetic people, long-established, that make these claims about what a cream, a nail polish, a hair remover or cold wave or hot wave, or whatever they are, are overclaiming the benefits of their material?

Dr. Allington. I think that with respect to the purely cosmetic angle, the way a preparation will make a person look, advertising claims would be a matter of judgment which would be very difficult to evaluate. If a company starts to make claims as to physical benefits, then I should think that certainly the advertising should be subject to considerable control.

Mr. McDonough. Well, physical benefits. You mean——

Dr. Allington. I think that with respect to the hormone creams, and with respect to, well, the matter that Dr. Epstein brought up regarding protection against injury from sunlight, with respect to claims such as those, I think regulations should certainly be in effect. When it comes to the way a cosmetic might make one appear or the allure it might give, I would be inclined to think that no advertising regulations need be enforced.

Mr. McDonough. You mean it may make one person more alluring than another, depending on how they use it and the individual applying it?

Dr. Allington. That is right.

Mr. McDonough. What I am getting at is—in addition to this suggested board of chemists, dermatologists, medical doctors, and other experts that might pass on it, do you think we ought to recommend to the Federal Trade Commission something in the way of control of claims on the part of cosmetics that cannot be proven?

In other words, here is a cream that perhaps would be beneficial in the event of sunburn. Here is another that may be beneficial insofar as beautifying the skin is concerned. But the attractive language that is used to make that claim is sometimes overdone. Do you think we ought to recommend anything along those lines?

Mr. Kleinfeld. If I may interrupt—under the present Federal Trade Commission Act, the Federal Trade Commission has that power

right now. To what extent it is exercising it is another matter, but the law does cover that situation.

Mr. HORAN. May I interrupt there?

Mr. MCDONOUGH. Yes.

Mr. HORAN. I would like to ask Mr. Kleinfeld—do you not feel that is one of the byproducts of our hearings? If it is proper and if it will serve society best, one of the byproducts of our hearings will be to direct the Federal Trade Commission to act in cases where it should be and where it perhaps has not been acting.

Mr. KLEINFELD. I agree.

Mr. MCDONOUGH. Do you agree with that, Dr. Allington?

Dr. ALLINGTON. Yes.

Mr. MCDONOUGH. Of course, any such regulation as that to a long, well-established cosmetic firm should not be very detrimental.

Dr. ALLINGTON. No, sir.

Mr. MCDONOUGH. It is the fly-by-night hit-and-miss firms, who operate in a basement or a kitchen and suddenly get a very attractive name for a little cold cream, a little olive oil, or a little perfume, whom we want to be sure the public is protected against. On the other hand, we are also interested in knowing whether the old-established firms may sometimes overclaim what they have, and we are also interested in any arbitrary actions on the part of the Food and Drug Administration, that may be affecting business in such a way that it denies freedom of operation. The committee is not one-sided. We are principally interested in the deleterious effects on individuals.

Dr. ALLINGTON. I agree that in general there is already good control on the part of most well-known manufacturers. The proper preparation and distribution of cosmetics should not be curtailed or unnecessarily interfered with. But I think that a law and an enforcement procedure which would provide adequate protection to the public could be so set up that it would not put unnecessary burdens on the manufacturer.

Mr. MCDONOUGH. Just one other question and I am through.

The motion-picture industry uses great quantities of cosmetics in order to set up the proper appearance of their actors.

Dr. ALLINGTON. Yes.

Mr. MCDONOUGH. Do you know whether there is any clause in the contracts of actors protecting him if any deleterious materials is used as part of his job that would adversely affect him?

Dr. ALLINGTON. I don't know.

Mr. HORAN. Have you seen any evidence of the influence of high taxes and inflation in the incidence of cosmetic difficulties on the part of the general public?

Dr. ALLINGTON. No, sir; I have not considered that angle at all.

Mr. HORAN. The reason for asking that question is in times of high prices and high taxes the inclination of people in certain categories of our society is to get something for less. We had 31 people, I think, die from drinking wood alcohol down in Georgia, which, of course, can be directly attributable—I just wondered if that occurred yet. It could.

Dr. ALLINGTON. I have not known of any such effect.

Mr. HORAN. Probably the people who might be the victims of that piece of our social economics would not come to a dermatologist anyhow. They would not have the funds to do so.

Dr. ALLINGTON. They could come to dermatological clinics.

Mr. HORAN. That is right. They have not yet?

Dr. ALLINGTON. No, sir; I haven't seen them.

Dr. MILLER. Dr. Allington, I did want to ask—is there anyone on the west coast, in the universities or individually, doing experimental work on estrogens' absorption or the effect of estrogen on human beings?

Dr. ALLINGTON. I am sure that research in the use of estrogenic hormones is going on in this area, but I cannot quote specific research projects offhand.

Dr. MILLER. We have considerable testimony in the hearings about stilbestrol and estrogen, particularly in chickens.

Showing the importance of it, Congressmen Reed of Illinois has introduced a bill to reimburse the mink growers of Illinois because they were advised by the Agriculture Department to feed the heads of chickens and entrails to the mink, and they did. After they did, they found they had contained stilbestrol, and the mink were sterile. They think they have been injured by their Government. That is how important it is.

Coming back to Dr. Hartman, who testified on pages 444 to 456 in part 1 of the hearings, several questions were asked him about estrogens. In fact, I asked him: "It is your opinion, Dr. Hartman, that estrogen, if it is in face cream, can be absorbed through the skin?"

He said, "There is no doubt about that."

He went on to say:

> Experimental evidence on rats. The literature is full of data in that respect. All you need to do is rub a little on the skin of a castrated rat and you cause cornification in the vagina in very short order. * * * I applied daily anointings, and in 4 weeks the breast that had the estrogen developed to a tree about 2 inches in diameter—really made a female breast on the young, immature male. That is one example.

Then he said further:

> I think it has a very similar effect on the connective tissue of the face that this estrogen has in your chickens. I state here on page 3: "The skin is improved in looks, partly by the swollen and stimulated connective tissue underneath, partly by its female texture." It is swollen by an accumulation of water.

He says it is kind of a face lifter to the individual who uses the hormone face cream. I wondered whether you had any experience such as Dr. Hartman had with this cream.

Dr. ALLINGTON. No, sir; I have not.

Dr. MILLER. Of course, we know that the use of hormones, estrogens, in the agricultural field is increasing, not only in chickens but in other animals. It is mostly water but they look better. They are used in sheep and hogs and cattle now, and it has a tremendous impact upon agriculture—the use of certain hormones, and when properly used.

I am not opposed to them in face cream, it may be a very fine thing if there are no bad results such as cancer or other things that might develop. I am sure you would say that if no bad results developed, there is no reason why a woman could not use hormones in face cream if she wanted to as long as she knew what she was using.

Dr. ALLINGTON. No, sir. I think, however, that is touching pretty close on a general medical problem, the ramifications of which are so great that it would be undesirable.

Dr. MILLER. You think one ought to have a prescription in order to use a little hormone in face cream?

Dr. ALLINGTON. Yes. If, for example, sufficient hormone were put in face cream to consistently cause the results you have mentioned, I am not at all sure it wouldn't eventually cause menstrual disturbance or other indirect untoward effects on other parts of the endocrine gland system which might be harmful. I think the hormone preparations are in every sense of the word potent and potential dynamite.

Dr. MILLER. You recognize it as a big new field?

Dr. ALLINGTON. There should be a great deal more known before hormones are released for general distribution indiscriminately.

Dr. MILLER. Thank you.

Dr. HEDRICK. Mr. Kleinfeld, do you have any questions?

Mr. KLEINFELD. Yes.

Doctor, in the Journal of the American Medical Association of May 28, 1949, there is a statement by the committee on cosmetics of the American Medical Association. It sets forth the rules governing the acceptance of cosmetics by that committee. Are you familiar with that statement?

Dr. ALLINGTON. No, sir; I am not. I may have read it, but I am not familiar with it.

Mr. KLEINFELD. In part this statement sets forth the studies which should be conducted. Some of the studies which the committee points out as being necessary are studies on patch tests, and it sets forth that 200 to 1,000 subjects should be used. The figure 200 to be regarded as an absolute minimum.

Would you agree generally with that?

Dr. ALLINGTON. Yes, sir.

Mr. KLEINFELD. It is also stated that there should be a retest in 14 to 21 days following the same routine that is followed at the original sites.

Would you be generally in accord with that?

Dr. ALLINGTON. That I think is an example of what Dr. Schwartz calls his prophetic patch tests, which is an attempt to determine sensitizing potential of a substance.

Mr. KLEINFELD. The committee on cosmetics of the American Medical Association continues, and I quote:

> It may be advisable to have a control experiment with old cosmetics of similar purpose and/or formula, when claims of superiority are offered or when irritation is a possible factor. Use either on alternate series of subjects or on same subjects dividing body surface (new cosmetics on one side, old cosmetics on other). If no dermatitis occurs in 200 subjects, product is probably safe; if in more than one, product unsafe. If only one case, retest a new series; if one or more cases in new series, product is unsafe.

Are you in general accord with that statement?

Dr. ALLINGTON. Yes, sir; I would be.

Mr. KLEINFELD. In other words, as far as these figures are concerned, they seem to state——

Dr. ALLINGTON. May I also say, however, that I think in addition to the special circumstances which prevail in patch testing that actual use tests, as nearly as possible in the same manner that the preparation is going to be used by the public in general, should be conducted before a new preparation containing unproven chemicals is used. There may be conditions develop in actual use tests which are not duplicated sufficiently in patch testing to prevent errors from creeping in.

Mr. KLEINFELD. Well, that probably is in accord again with what is contained in the statement. The statement continues as follows, and I quote:

> It may be advisable to have a trial sale, to be carried out where control or supervision can be maintained. Over a 6-month period, at least 1,000 units should be sold and watched.

Do you agree with that?

Dr. ALLINGTON. I should think that some such actual use test is in order.

Mr. KLEINFELD. And the patch tests?

Dr. ALLINGTON. The patch tests for their suggestive evidence, and the further practical experience of actual use tests.

Mr. KLEINFELD. Doctor, you mentioned paraphenylenediamine dyes.

Dr. ALLINGTON. Yes.

Mr. KLEINFELD. Are they coal-tar dyes?

Dr. ALLINGTON. I don't know, but I believe so.

Mr. KLEINFELD. I want to get your reaction to this part of the existing law, if you have an opinion on it. Section 601 (a) of the present Food, Drug, and Cosmetic Act provides:

> A cosmetic shall be deemed to be adulterated—
> (a) If it bears or contains any poisonous or deleterious substance which may render it injurious to users under the conditions of use prescribed in the labeling thereof, or under such conditions of use as are customary or usual: *Provided*, That this provision shall not apply to coal-tar hair dye, the label of which bears the following legend conspicuously displayed thereon: "Caution—This product contains ingredients which may cause skin irritation on certain individuals and a preliminary test according to accompanying directions should first be made. This product must not be used for dyeing the eyelashes or eyebrows; to do so may cause blindness," and the labeling of which bears adequate directions for such preliminary testing. For the purposes of this paragraph and paragraph (e) the term "hair dye" shall not include eyelash dyes or eyebrow dyes.

Are you familiar with the coal-tar colors as used in cosmetics?

Dr. ALLINGTON. No.

Mr. KLEINFELD. For example, if a coal-tar color may cause blindness if used in the orbital area, do you think it is safe for use in a product applied on the hair on top of the head?

Dr. ALLINGTON. I should think it would not.

Mr. KLEINFELD. Doctor, as we mentioned earlier today, the present law requires that drug manufacturers set forth on their labels the names of the active ingredients and the manufacturers of nonstandardized foods must set forth on their labels the common or usual names of their ingredients. From the viewpoint of both the consumer and dermatologist, do you know of any reason why the cosmetic manufacturer should not be under a similar requirement?

Dr. ALLINGTON. No.

Mr. KLEINFELD. Do you think it would help to have such a requirement?

Dr. ALLINGTON. Yes, sir; I think it would.

Mr. KLEINFELD. I have no other questions.

Dr. HEDRICK. Any other questions?

Mr. HORAN. I just want to know again, in making these tests, patch tests and tests on 200 to a thousand people, whether you think that Government itself should pay for these tests?

Dr. ALLINGTON. I would think that the burden of proof would be on the manufacturers.

Dr. HEDRICK. We thank you very much, Doctor. You made a very valuable witness, and we appreciate your coming before the committee.

Dr. ALLINGTON. Thank you, sir.

Dr. HEDRICK. Who is the next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Mr. Duffy.

(The oath was administered by the chairman.)

TESTIMONY OF MILTON P. DUFFY, CHIEF, BUREAU OF FOOD AND DRUG INSPECTIONS, STATE DEPARTMENT OF PUBLIC HEALTH, SAN FRANCISCO, CALIF.

Mr. KLEINFELD. Mr. Duffy, what position do you hold?

Mr. DUFFY. Chief of the Bureau of Food and Drug Inspections, State of California, Department of Public Health.

Mr. KLEINFELD. What are your general duties?

Mr. DUFFY. Enforcing the California Food and Drug Act, the Cannery Inspection Act, and related laws.

Mr. KLEINFELD. How long have you held that position?

Mr. DUFFY. Thirty-seven years.

Mr. KLEINFELD. Then you have had some experience.

Mr. DUFFY. Yes; I have.

Mr. KLEINFELD. Will you please read your statement?

Mr. DUFFY. To begin with, I want to state that as a food and drug regulatory official I wholeheartedly approve the purpose of the investigation of the committee. I have had an opportunity to read the testimony, which is now a matter of record before your committee, and I want to state that we in California fully realize that harmless chemicals or those chemicals which do not produce toxic properties have a place in the advance of food manufacturing today. We always bear in mind that everyone is a consumer of foods. We have had many years of contact with our industries and, with few exceptions, food industries in California are very cooperative with our offices.

My appearance here today, as I understand your letters of October 12, 1950, and September 24, 1951, is to testify to what this committee is particularly interested in, namely: (1) What policy, if any, does California have with respect to the introduction of chemicals in foods? (2) What legislation exists in California in connection with this problem? (3) What research in toxicity of chemicals has been carried on in California? (4) Our views on the public-health aspects of the problem? (5) Our opinion as to whether Federal legislation should be enacted, as in the case of new drugs, that chemicals introduced in food and shipped in interstate commerce, shall first be demonstrated to be safe to the satisfaction of the Food and Drug Administration?

On November 29, 1950, I submitted my answer to your letter, which letter forms part of the record in House Resolution 74, part I, pages 38 and 39. At this time I desire to amplify my statements in the above-mentioned letter for the purpose of bringing out more clearly our policy on this subject.

If an individual or manufacturing concern contacts our office relative to the use of any chemical in a food product, he or they are advised

that if safety for use has not been determined, said chemical cannot be used, and they are then and there requested to furnished the necessary evidence as to its safety. Upon receipt of the documentary evidence as to the safety of said chemical, we immediately contact the United States Food and Drug Administration asking their opinion on the subject. We likewise submit the same to our consultants here in California. After the receipt of the opinions from the above agency and our own consultants, the firm or company inquiring is advised as to our decision based on the evidence submitted.

Dr. MILLER. At that point, supposing a manufacturing concern does not contact your organization and goes ahead and uses the chemical and does nothing about it.

Mr. DUFFY. I will bring that out, Congressman, in just a minute.

Dr. MILLER. All right.

Mr. DUFFY. If the chemical is found to be toxic or poisonous I submit the findings to the State board of public health for the purpose of adopting a regulation to prohibit its use in food products. (This is in accordance with the administrative code, State of California, which provides for a public hearing.)

If we find in our field work a plant using a chemical, the toxicity of which is unknown to us, the inspector immediately samples both the raw material and finished product and the above-mentioned procedure is followed. The manufacturer is advised to cease using it until the safety is established.

Now, answering your question specifically, I say this: That we have in mind that our first duty is to the consumer of food. We have at our disposal in California our consultants, from whom we seek advice as to the safety for use of chemicals in foods.

If a field inspector reports to me that a firm is packing a product with a certain chemical which we cannot find in the literature, I usually communicate with the technical staff of the industries packing the same product to ascertain if they have any information on this chemical.

We are fortunate in California in having some trade associations that are really public-health minded and who can place at our disposal men who have scientific training that can advise us of these things when we don't know what the chemical is.

Dr. MILLER. How many chemicals have you so analyzed?

Mr. DUFFY. How many?

Dr. MILLER. Yes.

Mr. DUFFY. Hundreds of them.

Dr. MILLER. You say hundreds. Can you be specific about it?

Mr. DUFFY. Monochloracetic acid—you have gone into another field here this morning which I am not prepared to talk on in this paper—cosmetics—paraphenylenediamine. We do have a law prohibiting this chemical in eyebrow and eyelash dye.

Dr. MILLER. If you have read the hearings, and you said you have, you realize there are between 700 and 800 chemicals being used in the food industry.

Mr. DUFFY. I read that.

Dr. MILLER. And 200 or 300 not even tested.

Mr. DUFFY. That is correct.

Dr. MILLER. You certainly do not have enough inspectors to go around and test each one. I want to know whether it is tested before

it is put in the food. You do not say so. You say if you find someone using a chemical whose toxicity is not known before——

Mr. DUFFY. I think we have got an excellent set-up here.

Dr. MILLER. You say if you find someone using a chemical and you do not know whether it is toxic or not, you begin to investigate it. Why don't you investigate it before they use it?

Mr. DUFFY. I will bring it out, I think, here.

Mr. MCDONOUGH. You say, "If an individual or manufacturing cooncern contacts our office relative to the use of any chemical in a food product." What if it is not being manufactured in the State of California but being sold in that State and manufactured in some other State; do you look into that also?

Mr. DUFFY. Oh, yes. Our contact with the United States Food and Drug Administration all my years on the job has been one of excellent cooperation with them and of working together.

Mr. MCDONOUGH. And that applies to the distributor of material not manufactured in California as well?

Mr. DUFFY. Yes.

Mr. MCDONOUGH. I think the laws of California will match Nebraska any day of the week on that.

Dr. MILLER. I am not talking about that. I am not casting any reflection on California. I say the gentleman's statement does not hold water. He says if a concern contacts. Suppose they don't contact.

Mr. DUFFY. I add a little later——

Dr. MILLER. Wait a minute. Do they contact you before they use the chemical; yes or no?

Mr. DUFFY. I can specifically tell you the California canning industry does.

Dr. MILLER. Do they have to?

Mr. DUFFY. No.

Dr. MILLER. Then a fly-by-night concern can come in and use any chemical they want to and you know nothing about it.

Mr. DUFFY. We find out ourselves. No doubt the question now is: Does California have authority under existing legislation to adopt such a policy? We feel we do, and the State attorney's general office, who is our legal adviser on this question, has so advised us. As to the legislation which exists in California in connection with this problem, I desire to state that California was one of the first States to adopt the uniform food and drug law sponsored by the Association of Food and Drug Officials of the United States at its conference in Hartford, Conn. in 1939. We have, from time to time, added sections to the food law which have a direct bearing on the subject under discussion; namely, added chemicals to foods, and I quote:

SECTION 26472. A food shall be deemed to be adulterated:

(*d*) If any mineral oil has been added thereto or mixed or packed therewith.

(*e*) If it be fresh meat and it contains any chemical substance containing sulfites, sulfur dioxide, benzoate of soda, or any other chemical preservative, or any substance which is not approved by the United States Bureau of Animal Industry, or the United States Department of Agriculture, or the Bureau of Animal Industry of the California State Department of Agriculture, or the California State Board of Public Health.

Here I come to admitting what you say.

Though we do not have, in California, any legislation which requires a manufacturer to submit to our department, before use, any new

substance for the purpose of enabling us to determine whether or not it is harmless or deleterious, we have enjoyed the cooperation of the industry in that respect with minor exceptions.

Dr. MILLER. I think you follow the food and drug law.

Mr. DUFFY. That is right.

Dr. MILLER. They do not require it, either. But you are neither ahead nor behind, perhaps, the national standard. I was hoping that as a State you required these people to bring evidence to you that it was not harmful even before they used it.

Mr. DUFFY. We are not equipped, Congressman.

Dr. MILLER. You are not in position to do that, and I think that is generally true of other States, too.

Mr. DUFFY. Yes, sir.

Dr. MILLER. And that is the thing that concerns our committee, as to whether the burden of proof should be upon the manufacturer to submit evidence that a substance is not harmful before he has used it, not afterward.

Mr. DUFFY. That is correct. As a practical matter, the industry contacts our department relative to such chemicals prior to use, and we employ the facilities of our consultants and Federal Departments to determine whether it should be used and, if necessary, what tolerances should be required. After our views have thus been given, industry abides by them. As to the few exceptions which I mentioned, an explanation of the provisions of section 205 of the Health and Safety Code, which authorizes us to commence proper and necessary action to protect and preserve public health, has been sufficient to bring them in line.

We also have specific laws as well as regulations pertaining to dangerous chemicals such as:

1. Poisons in alcoholic solutions for potable purposes. Section 347 B Penal Code (enacted 1930), states as follows:

POISONOUS ALCOHOLIC SOLUTIONS: DISPOSITION OR MANUFACTURE: BURDEN OF PROOF: PUNISHMENT

It shall be unlawful for any person, firm, or corporation to manufacture, sell, furnish, or give away, or offer to manufacture, sell, furnish, or give away any alcoholic solution of a potable nature containing any deleterious or poisonous substance, and the burden of proof shall be upon the person, firm, or corporation manufacturing, selling, furnishing, or giving away, or offering to manufacture, sell, furnish, or give away any such alcoholic solution of a potable nature containing any deleterious or poisonous substance, to show that such alcoholic solution of a potable nature did not contain any deleterious or poisonous substance. Every person who violates any of the provisions of this section is guilty of a misdemeanor, and shall be punished by a fine of not less than five hundred dollars, or more than two thousand dollars, or by imprisonment for not less than thirty days or more than two years, or by both such fine and imprisonment. (Added by Status, 1931, p. 237.)

This section was added after the "Jake Ginger" deaths during prohibition.

2. Dinitrophenol formerly used as a reducing agent. Section 382.5 of the Penal Code states as follows:

I have only put this section in here because I thought there might be a possibility of some faddists using dinitrophenol for reducing purposes.

Dr. MILLER. Fattists or faddists?

Mr. DUFFY. Faddists. [Laughter.]

Dr. HEDRICK. Proceed.

Mr. DUFFY (reading):

SALE, ADMINISTRATION, OR PRESCRIPTION OF DINITROPHENOL: PUNISHMENT WHEN NOT AN OFFENSE

Every person who sells, dispenses, administers, or prescribes dinitrophenol for any purpose shall be guilty of a felony, punishable by a fine not less than one thousand dollars nor more than five thousand, or by imprisonment in the State prison for not less than one year, nor more than fourteen years, or by both such fine and imprisonment.

This section shall not apply to dinitrophenol manufactured or sold as an economic poison registered under the provision of Section 1071 of the Agricultural Code nor to sales for use in manufacturing or for scientific purposes and not for human consumption (Added by Stats. 1939, p. 1989).

3. Chapter 10 of the Health and Safety Code relating to food sulfurs for sulfuring fruits or other foods, section 28505, states as follows:

No person shall use sulfur containing more than 10 parts per million of arsenic oxide (As_2O_3) for the purpose of sulfuring fruits or other foods.

Mr. HORAN. Might I ask there, Mr. Chairman—do you regard sulfur in itself as necessarily a menace to public health?

Mr. DUFFY. Sulfur itself?

Mr. HORAN. Yes.

Mr. DUFFY. No. It is a drug to be used.

Mr. HORAN. That wasn't clear in your testimony.

Mr. DUFFY. Yes.

4. At the 1951 session of the California Legislature there was enacted and approved by the Governor section 26470.5 of the California Pure Foods Act which states as follows:

Nothing in this article shall prohibit the adding of fluorine or fluorine compounds to water intended for sale to the public as bottled water for domestic use in such manner and to such an extent as may be approved by the State department; provided, that the labeling requirements hereinafter set forth in this chapter are met.

By regulation this amount has tentatively been set at not less than 0.8 nor more than 1.2 p.p.m.

Also the State board of public health has adopted regulations for tolerances of arsenic and lead and fluorine in foods—sections 10446, 10447 and 10448 of the California Administrative Code, title 17, public health.

Likewise, the State board of public health has adopted a regulation prohibiting the use of cadmium utensils for food—section 10159 of the California Administrative Code, title 17, public health.

Mr. MCDONOUGH. Cadmium utensils.

Mr. DUFFY. Yes, sir.

Mr. MCDONOUGH. Do you believe cadmium-lined utensils——

Mr. DUFFY. They have made them both of pure metal and cadmium-lined.

Mr. MCDONOUGH. Who would ever use cadmium utensils?

Mr. DUFFY. In your home town, Los Angeles, in the early days of the first bulk orange-juice dispensers they had cadmium poisoning in many, many cases.

Mr. MCDONOUGH. So you have a section now that prohibits the use of cadmium-lined or utensils made of cadmium metal?

Mr. DUFFY. Any way at all.

Mr. McDonough. In the production of what kind of foods, any kind of foods?

Mr. Duffy. Any kind.

Mr. McDonough. In the process of manufacture?

Mr. Duffy. Yes, sir.

Mr. McDonough. That does not apply to aluminum, of course?

Mr. Duffy. No, sir.

In addition, the State Board of Public Health has adopted a regulation prohibiting the use of monochloracetic acid in foods—section 10468 of the California Administrative Code, title 17, public health. The State Board of Public Health has also adopted regulations governing the cellar treatment of wines in which certain chemicals are permitted, and limiting the sulfur dioxide content to 350 parts per million—section 10615, California Administrative Code, title 17, public health.

Our decisions relative to the subject matter under discussion, added chemicals in foods, and those sections of the laws which I have quoted have never been questioned legally. We do feel that all chemicals—except those definitely known to be harmless—should be screened and that there should be no question as to the safety of same.

As to the research on toxicity of chemicals used in food, we in California have done little or no work on this subject. We depend upon the Federal and State agencies and our consultants for this advice.

As far back as a year ago, at a conference with our State officials of various departments, and representatives of the University of California, I recommended the establishment of a central laboratory for the screening of all chemicals, pesticides, et cetera, for toxicity studies. It was my recommendation that this central laboratory would serve all State agencies in California who have a responsibility in the problem now under investigation by this committee.

I do not want the committee to get the impression, from my statements, that no chemicals of questionable toxicity are used in California. There have been some, and more than likely they are being used as of this date; however, when we find them, we act. As to the public health aspects of the problem under consideration, I desire to go on record that we are concerned with the use of many new chemicals being offered by manufacturers to food industries. Little is known as to the toxicity of the same, and it is my opinion that these chemicals should not be used until complete toxicity studies have been made.

Conclusions: Your committee has requested my opinion on this very important public-health problem; therefore, I desire to state that we in California have always enjoyed excellent cooperation with the United States Food and Drug Administration—it has worked both ways.

I also want to state that I doubt seriously, although there is and always will be differences of opinion relative to the toxicity of chemicals used in foods or in food production, that there is anyone in this country better qualified on the subject than Dr. Arnold Lehman. However, from my many years of close association with the Food and Drug Administration, I do not want to convey the impression to the committee that I favor the Food and Drug Administration because of my personal contacts and friendship with some of its personnel.

I feel that what this committee desires is to find the answer and if there is a necessity for this legislation. Therefore, I submit the following: I am not a lawyer and I have no more knowledge of the administrative law than a person in my position might be expected to acquire through 37 years of experience as a regulatory official. It is my view, however, that Federal legislation should be enacted providing that chemicals introduced in foods shipped in interstate commerce shall first be demonstrated to be safe. Whether this safety shall be demonstrated to the satisfaction of the Food and Drug Administration, or to create a new Federal agency, or to some other Federal agency, or to a group of Federal agencies, is not within the scope of my qualifications.

I also subscribe to an advisory council being set up in the agency delegated with this authority, which should consist of pharmacologists who are recognized as authorities in their respective fields. It is my personal view, however, that such demonstrations will have to be made to the satisfaction of several agencies; namely, those having an interest in (1) chemicals added to food and food products; (2) the effect of pesticides upon the health and welfare of the consumer by reason of toxic residues remaining on such food and food products; as the result of such use; (3) the nature, effect, and extent of the use of chemical compounds and synthetics in the manufacture of fertilizer as it affects public health and welfare. Those concerned are the following: United States Public Health Service; United States Food and Drug Administration; United States Department of Agriculture; United States Treasury Department; Bureau of Internal Revenue, Alcohol Tax Unit.

It appears to me that the agencies which I have mentioned and possibly others should have a part in the screening process; otherwise, a duplication of effort on the part of these agencies with the resulting conflicting opinions is bound to occur. The processing through these agencies acting as consultants might be handled in somewhat the same fashion as a new drug application is handled under the present Federal Food, Drug, and Cosmetic Act. No doubt this committee, on the basis of the evidence submitted, will be able to determine the vehicle to be used and the modus operandi of processing the application.

Thank you.

Dr. HEDRICK. Mr. Jones, do you have any questions?

Mr. JONES. First, I would like to say that it has been my observation that California appears to be ahead of a majority of the other States, and I doubt if any State excels this State in the protection that is afforded the public.

I certainly would not concur in condemning the State of California for not going further, but I would commend them for the actions which they have taken, and particularly to commend you for your statement of cooperating with this committee and with the Federal authorities in establishing regulations which will have that effect.

I have no questions on the statement made.

Dr. HEDRICK. Is it not your opinion that the manufacturers should always bear the costs of determining whether these chemicals are safe?

In other words, the taxpayers should not have to bear the burden of determining that; it should be on the manufacturers. How do you feel about it?

Mr. DUFFY. We are taxed so much now I don't know how much more we can be taxed.

Dr. HEDRICK. That is what I was trying to get away from—additional taxes. I see no reason why the taxpayer should contribute to determining whether these things are safe or not. The manufacturer should have to pay for that. Don't you feel that way about it?

Mr. DUFFY. I am not qualified to answer that, Congressman.

(Discussion off the record.)

Mr. MCDONOUGH. The public is going to pay anyway. If the manufacturer puts it in his cost of production, the public is going to pay the bill. I think the policing is far more expensive to the public where you have an unscrupulous group of manufacturers throughout a State or the Nation. That is more costly than your testing of new materials because you got so many materials already on the market that it takes a great body of men to police them, and that is added to the tax roll also. But John Q. Public can never get away from the fact that when the manufacturer adds to his cost he is going to charge it to Mr. John Q. Public.

Dr. HEDRICK. Dr. Miller, do you have any questions?

Dr. MILLER. Well, so that my statement earlier will not be misinterpreted, I don't think California is any better or any worse than any other State in the Union as far as following the Food and Drug Act is concerned.

I am concerned, though, that the present Federal Food and Drug Act does not place the burden of proof on company X that is going to put a new chemical in the food stream. I think we ought to place the burden of proof some place before it is used, not after it is used.

I notice on page 9 you state:

> It is my view, however, that Federal legislation should be enacted providing that chemicals introduced in foods shipped in interstate commerce shall first be demonstrated to be safe.

I agree with that, but why just interstate commerce? Why don't you in California or we in Nebraska do the same thing before we put it into foods?

Mr. DUFFY. This will be my personal statement, not the Department. I had that in my paper. I personally feel if Congress enacts such legislation, we have a public-health-minded Governor in California and a public-health-minded legislature, and I will assume the responsibility for getting a similar law.

Dr. MILLER. I think that is fine. I like your statement and the suggestions you made. The safety should not be just in interstate traffic.

Mr. DUFFY. That is correct.

Dr. MILLER. It should cover that within the State also, and I think most States try to keep in step with the Federal law.

It does seem that the Federal Food and Drug has been slow to act. It has been behind the march of progress. In many instances, the public has not been properly protected because chemicals have not been first examined as to their effects upon the food stream before they are used.

Mr. DUFFY. Yes, sir.

Dr. MILLER. And that should be No. 1, it would seem to me. Would you agree to that?

Mr. DUFFY. Yes, sir, I do.

Dr. MILLER. And do you think California would probably fall in line?

Mr. DUFFY. Yes, sir.

Dr. MILLER. As to chemicals in food, or even pesticides that might be used on your celery or other growing crops, as to keeping in line with the Federal law?

Mr. DUFFY. Yes, sir.

Dr. MILLER. I think that is all.

Dr. HEDRICK. Mr. Horan.

Mr. HORAN. Mr. Duffy, I am, too, very impressed with the comprehensive and very responsible nature of your testimony. I want to commend you on that statement. How long have you had a food and drug division of the California Public Health Department?

Mr. DUFFY. Since 1907.

Mr. HORAN. Have you been active in all that time?

Mr. DUFFY. I have been active since 1914.

Mr. HORAN. Because my own State of Washington has been rather tardy in developing a similar division in their public health department. I believe there is one now appended to the agricultural department up there, however, in the State government. I think it is very helpful in this Union of States of ours that the responsibility reside as close to the individuals in the State as possible.

Mr. DUFFY. That is right.

Mr. HORAN. I am not one that is married to the idea of Federal policing and all that sort of thing unless it is entirely interstate. However, I have a rather interesting question to ask you now, because I showed the news article to the chairman of this committee on the floor of the House about 6 weeks or 7 weeks ago. Gloria Swanson was running all over Hollywood telling people not to eat any food, any fruits or vegetables, that had been sprayed with insecticides, that they might become ill. What do you do in a case like that?

Mr. DUFFY. We have no law to cover what people say.

Mr. HORAN. Exactly. But someone who is in the consumer field can be equally irresponsible; is that not true?

Mr. DUFFY. That is correct.

Mr. HORAN. What do you do in a case like that—nothing?

Mr. DUFFY. I don't like to step out of my own field.

Mr. HORAN. No, that is directly in your field and affects a number of producers in the State of California who are probably more responsible in their attitudes than someone who may go out and carry stories around in the consuming areas such as was reported in the Washington News. It is a vital thing. But there are a lot of essentials produced here in this State that have to be protected, and you have the responsibility of finding out whether they are fit for human consumption when offered to the public.

Mr. MCDONOUGH. That is right.

Mr. DUFFY. That is right.

Mr. HORAN. Somewhere in our society there is a loose link that enables people or inspires them to go out and carry stories of that nature.

Mr. DUFFY. We cover that, I guess you could say, in our talks to service groups. At the moment we are giving a talk down at San Bernardino to seven or eight hundred high school students, and we spread the gospel that the laws are being enforced, the Federal law as well as the State law. We can't say there is no danger in spray residue, because there is a possibility there might be. Certainly the statement that she is making is not right.

Mr. HORAN. That brings up the matter of responsibility on your part. Now I am a producer. We have an excellent committtee here. We have a couple of physicians, a chemist, three very able lawyers, and I am an apple and pear producer. As such, I look to those—I pay my taxes to correct those things.

Did anybody answer Gloria or anybody put out a statement answering this Associated Press article in the Washington newspaper that I read? Did anybody make any effort in high places?

Mr. DUFFY. Here in California?

Mr. HORAN. Yes, to correct that?

Mr. DUFFY. I have been away and have never seen the statement.

Mr. HORAN. I do feel, Mr. Duffy, those are things we ought to police as greatly as we do what is in this, or what is on that. It is a matter of psychology in our society and assurance from your office to counteract gossip would be something that you should give some thought to. It is a different field, and I recognize that; but immeasurable damage can be done, and I think you realize it.

Mr. DUFFY. Yes, sir.

Mr. MCDONOUGH. Mr. Horan, I realize the disadvantage it is to the apple industry and how detrimental it is, but you are entering into the field of freedom of speech without responsibility in that case.

(Discussion off the record.)

Mr. HORAN. For the record, we have not used lead spray in Washington since 1933.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. I merely want to compliment Mr. Duffy. I think you have given us some very valuable information in the testimony you have given. It is along the same lines as the information we have received in every one of our hearings heretofore with regard to deleterious material in insecticides, fertilizers. In these matters California is an exemplary State. It has been mentioned in the hearings in the East time after time.

The only question I wanted to ask, since you didn't cover anything on cosmetics—do you think the same precautions should be applied to cosmetics as are applied to foods and insecticides, as you have outlined here?

Mr. DUFFY. Absolutely. I have made three attempts to get a cosmetic law.

Mr. MCDONOUGH. In the State of California?

Mr. DUFFY. Yes. I have lost every time.

Dr. MILLER. Who blocked you?

Mr. DUFFY. The same thing that happened in Congress, I guess. [Laughter.]

Dr. MILLER. I see.

Mr. DUFFY. We will try again, though.

Dr. HEDRICK. Mr. Kleinfeld?

Mr. KLEINFELD. No questions.

Dr. HEDRICK. Mr. Duffy, we are very grateful for your testimony.
Mr. DUFFY. Thank you very much.
Dr. HEDRICK. Who is the next witness?
Mr. KLEINFELD. Dr. Abrams.
(The oath was administered by the chairman.)

TESTIMONY OF HERBERT K. ABRAMS, M. D., CHIEF, BUREAU OF ADULT HEALTH, STATE DEPARTMENT OF PUBLIC HEALTH, BERKELEY, CALIF.

Mr. KLEINFELD. Dr. Abrams, are you a medical doctor?
Dr. ABRAMS. That is right.
Mr. KLEINFELD. Where did you get your degree?
Dr. ABRAMS. University of Illinois.
Mr. KLEINFELD. When?
Dr. ABRAMS. Nineteen forty.
Mr. KLEINFELD. Have you practiced medicine?
Dr. ABRAMS. I have been in public-health practice ever since.
Mr. KLEINFELD. And your present position is that of chief of the bureau of adult health, State Health Department of California?
Dr. ABRAMS. That is right.
Mr. KLEINFELD. Generally, what are your functions?
Dr. ABRAMS. The bureau of adult health conducts the industrial-health program of the State health department, and my functions are administrator of that program.
Mr. KLEINFELD. Will you please read your statement, Doctor.
Dr. ABRAMS. As I said, my position is that of chief of the bureau of adult health, State Health Department of California. This bureau carries out the industrial-health program of the State health department. My knowledge of chemicals which may be used in connection with food products is limited to the occupational hazards to workers who come in contact with them in manufacturing, distributing, or applying them. For example, we in our bureau are concerned with the health hazards to farmers who spray insecticides for the control of crop pests and with the workmen in chemical factories which manufacture chemicals, et cetera. We are not concerned with the hazards to the consumer of the food product which may have been treated with one or more chemicals in the course of its production. Therefore, at the outset I must inform the committee that my knowledge of the health hazards to the consumer of foods treated with chemicals is only incidental to my main job, and I cannot give you an authoritative statement on the subject.

The Bureau prepares bulletins in regard to occupational diseases, including those due to agricultural chemicals, and distributes them to physicians on request as well as to a large mailing list of physicians known to be interested in occupational medicine. Bulletins on the hazards of pesticides are also prepared and distributed to licensed pest-control operators and, on request, to the public. The Bureau frequently furnishes speakers for meetings of pest-control operators or physicians and for short courses sponsored by the University of California.

Because of the occupational aspects of my work, the types of chemicals with which I am concerned are more or less limited to the group of pesticides and other so-called economic poisons which are used

mainly in connection with agricultural needs. I have had no contact whatever with a large group of chemicals such as food preservatives, bleaching agents, and others which are added to food but which have not come to the attention of our Bureau as being occupational health hazards.

One further distinction to make is that the problem of chemical additives to food is based on the toxicity of chemicals when ingested. In occupational health work we are concerned primarily with chemicals which may be inhaled by the workmen or which may be absorbed into the body through the skin.

There are certain relationships between the toxicity of chemicals to which people are occupationally exposed and chemicals which are absorbed through the gastrointestinal tract. For this reason, we thought the committee would be interested in knowing of some of the occupational health problems in California which are presented by the so-called agricultural chemicals and types of disease conditions as reported in California for the year 1950. You will note in the attached tabulations that there were reported in California in 1950 almost 300 cases of occupational poisonings from agricultural chemicals. The chemicals ran the gamut of old and new products and the occupations ranged from farming to manufacturing. The types of symptoms varied from acute localized manifestations to more generalized systemic conditions.

In California we have certain legal controls which are helpful in safeguarding the health of people who may be exposed to the economic poisons in the course of their occupations. For example, we have industrial safety orders which give rules and regulations governing the handling of some of these materials in industrial processes. There are also the industrial labeling orders which require that certain kinds of information be printed on the label of certain chemicals when used in the industrial plant. Both of these regulations are administered by the State department of industrial relations. In both cases the regulations do not entirely cover the wide spectrum of chemicals in use. For one reason there is a constant stream of new chemicals being introduced and our knowledge of the toxicity of many of them is very deficient.

The bureau of chemistry of the State department of agriculture also administers the registration requirements for economic poisons before they can be marketed in California. Undoubtedly, Mr. Allen B. Lemmon, who is chief of that bureau, will inform the committee in detail of what the registration law means. It is helpful to us in our department of public health because it does require that certain minimum information concerning toxicity be available before a given product can be marketed. It also requires adequate labeling of the product so that the public can be informed of what it is using.

However, there are a number of unanswered questions common to both occupational health and consumer health which limit the efficacy of our control measures. These include (1) The problems of residues of agricultural chemicals on farm products. There are still large question marks as to the length of time which certain chemicals remain active. For example, we have had reports in the past 2 years of at least two instances in which fruit pickers were overcome apparently by inhalation and skin absorption of organic phosphorous chemicals—in one case 11 days after application of the chemical and in

another case about 30 days following application. While we are concerned entirely with the occupational hazard involved, one can readily see that there may be a consumer hazard as well.

Mr. HORAN. Might I interrupt there, Mr. Chairman?

Dr. HEDRICK. Yes.

Mr. HORAN. I presume you know that the Federal Government, through the United States Department of Public Health, has now under way up in the State of Washington, where we use insecticides extensively——

Dr. ABRAMS. Yes, sir.

Mr. HORAN. In Wenatchee they have established the basic laboratory and they are going to run clinical tests at the Marine Hospital in Seattle dealing with exactly this matter of exposure by workers and pickers in the orchards and groves.

Dr. ABRAMS. That is right.

Mr. HORAN. So we will know specifically as to whether or not it is due to that cause.

Dr. ABRAMS. Yes.

Mr. HORAN. I wanted to interrupt there, because I think it is important supplemental to your testimony.

Dr. ABRAMS. Yes. Thank you very much.

I am acquainted with that, and I think it is a very good step they have taken there. Another problem that we are concerned with is the relatively new problem of some of the so-called systemic chemicals such as octomethylphosphoramide—OMPA—which have the ability to penetrate the growing plant and become a part of its structure so that the plant itself becomes poisonous to insects, thus eliminating the necessity of periodic external application of the chemical to the growing crop. Thus far, registration of these products in California, I am informed, is being held up until further information on toxicity is obtained. As we understand it, these chemicals would be restricted to use only on nonfood crops. However, one can appreciate the urgent need for controls to make sure that these materials do not get into food crops. Our knowledge of the chronic disease effects of many of these chemicals, including both old and new ones, is extremely deficient. While we know of many instances of acute poisoning and these can be documented and described, our knowledge of the possible long-term effects of inhalation or other contact with small amounts of these materials is poor. Further intensive research is needed, and this means that governmental and private support is needed to make possible this research.

In conclusion, we should like to repeat a statement made before a meeting of the American Chemical Society about 2 years ago regarding the need for a public health program for the control of economic poisons:

PUBLIC HEALTH PROGRAM FOR CONTROL OF ECONOMIC POISONS

A well-planned public health program is needed for the safe exploitation of the agricultural chemicals. Such a program should embody the following features:

Research: Many economic poisons are released on the market prior to adequate research in their toxicity. Too often human injury is the stimulus to research which should have been done before the material was used. There is need for the training of more personnel in the fields of toxicology, pharmacology, and occupational health. There is an urgent need for the augmentation and improvement of present research facilities. There is a need for the better co-

ordination and free exchange of information between private and public research groups.

Cooperation of private and public agencies: The Federal, State, and local public health agencies, the agricultural agencies, and the chemical manufacturers and distributors should maintain a close liaison for the exchange of information and the prompt promulgation of public education and control measures.

Legal controls: These include a labeling law requiring all economic poisons to be clearly labeled according to content and amount of each ingredient, with appropriate statements on first-aid measures and precautions; and an adequate system of inspection and enforcement for the presence of poisonous residues on the surface of, or within, the foods placed on the market. It is recommended also that the States adopt legislation consistent with the Federal laws.

Education in the occupational health and consumer health aspects must be extended. Public-health agencies in collaboration with the agriculture and food and drug agencies should disseminate appropriate educational material for farmers and allied workers, for the employees engaged in handling and manufacturing economic poisons, for the medical and allied professions, and for the public generally.

Dr. HEDRICK. Any questions, Congressman Jones?

Mr. JONES. No questions.

Dr. HEDRICK. Dr. Miller?

Dr. MILLER. No questions.

Dr. HEDRICK. Mr. Horan?

Mr. HORAN. No questions.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. No questions.

Dr. HEDRICK. Thank you very much for your statement, Doctor. It is an excellent statement.

Who is the next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Mr. Glaive.

Mr. GLAIVE. I am merely here to answer questions, if anyone wishes to propound them, in connection with the statement made by Mr. Duffy. I have no statement to make unless you wish to ask questions.

Mr. KLEINFELD. Have you not submitted a statement on behalf of the Bureau of Vector Control?

Mr. GLAIVE. No; I have not, sir. Dr. Peters probably has.

Mr. KLEINFELD. Will you come forward, Mr. Glaive?

(The oath was administered by the chairman.)

STATEMENT OF AUGUST GLAIVE, CHIEF CHEMIST, FOOD AND DRUG LABORATORY, STATE DEPARTMENT OF PUBLIC HEALTH, SAN FRANCISCO, CALIF.

Mr. KLEINFELD. What is your full name?

Mr. GLAIVE. August Glaive.

Mr. KLEINFELD. What position do you hold?

Mr. GLAIVE. I am chief chemist of the food and drug laboratory, State department of public health.

Mr. KLEINFELD. You are a State official?

Mr. GLAIVE. That is right, sir.

Mr. HORAN. I wish to ask a follow-up question on the question I asked Mr. Duffy. How can we assure the public, both the producers and the consumers, because in final analysis we tend to all fall into one category or the other, how can we assure the general public that in the State of California and on the Pacific coast generally that our producers of foodstuffs are trying to do a job? How can we do that?

How can we counteract some of the faddists who run around trying to poison the minds of people about certain food products? When the facts in the case are known, that industry is trying to do a job, you know what I am talking about.

How can we reassure the people, or how can we counteract that sort of propaganda?

Mr. GLAIVE. That I really don't know, but I would venture the opinion that the people still have a little bit of faith in their Government. There should be an educational program of some kind which could pass on to the public the information as to the why and wherefore of the presence of certain substances and why certain ones are prohibited in foods.

There should be a program of education placed in the hands of probably Federal and also State organizations. Education is the only way to counteract that particular type of misinformation passed on to the public by irresponsible parties.

Mr. HORAN. Does your department have such an educational division?

Mr. GLAIVE. We don't, but individually, Mr. Duffy particularly, and others, people of experience, are trying to pass on to those interested, proper information as much as we possibly can. We cannot specifically mention by name items labeled or well known because that would be needlessly placing ourselves under possible libel action. But we do give some information to the public if they care to ask a question. If they do ask a question, we will answer it as well as we possibly know.

Mr. HORAN. You do not initiate such educational programs?

Mr. GLAIVE. We have no means for that, State or otherwise.

Mr. HORAN. The case I mention—I care not to repeat it—when that occurred no action was taken by your division, was it?

Mr. GLAIVE. I wouldn't know. It didn't come to my attention. I haven't even seen the statement and can't venture an opinion.

Mr. HORAN. Personally, I feel that when an incident of that type occurs some action should come out of the Pure Food Division of the California State Department of Public Health. I feel that myself because I belong to the fraternity of producers who are trying to do a job in the interest of production, feeding the public, and at the same time conforming with the laws and regulations which conform with the public health standards. Something should be done. There is a loose link there some place. Do you not agree with me on that?

Mr. GLAIVE. Yes. Not necessarily some action, but information should be forthcoming, if possible, through some regulation or legislative act of some kind—an educational program of some kind.

Mr. HORAN. That is all, Mr. Chairman.

Dr. HEDRICK. Any other question?

Dr. MILLER. Mr. Duffy, in his statement, on page 3 said:

> If we find in our field work a plant using a chemical, the toxicity of which is unknown to us, the inspector immediately samples both the raw material and finished product and the above-mentioned procedure is followed. The manufacturer is advised to cease using it until the safety is established.

Do you think, sir, that the safety of the product ought to be established before the individual is permitted to use it?

Mr. GLAIVE. It would be wonderful if it could be done that way.

Dr. MILLER. Do you think a Federal law should be enacted to place the burden of proof upon the individual, and that the product would not be used until someone had passed upon it?

Mr. GLAIVE. Cooperatively between the producer, and also the State agencies concerned with that, it should be a matter of cooperation. We are willing to give cooperation.

Dr. MILLER. Do you think there ought to be some evidence presented to the proper agency that the chemical or the material to be used is not harmful before it is used?

Mr. GLAIVE. Very definitely, sir.

Dr. MILLER. That is all.

Dr. HEDRICK. Who is the next witness?

Mr. KLEINFELD. Mr. Peters.

Mr. PETERS. Do you wish me to come forward or answer questions?

Dr. HEDRICK. Come forward.

Do you have a prepared statement?

Mr. PETERS. The prepared statement has been presented to you in advance. It is rather involved.

(The oath was administered by the chairman.)

TESTIMONY OF RICHARD F. PETERS, CHIEF, BUREAU OF VECTOR CONTROL, STATE DEPARTMENT OF PUBLIC HEALTH, SAN FRANCISCO, CALIF.

Mr. KLEINFELD. What is your full name?

Mr. PETERS. Richard F. Peters.

Mr. KLEINFELD. What position do you hold?

Mr. PETERS. Chief of the bureau of vector control of the State department of public health.

Mr. KLEINFELD. How long have you held that position?

Mr. PETERS. Since July of this year.

Mr. KLEINFELD. And what did you do previous to that?

Mr. PETERS. I have been the equivalent of assistant chief of the same bureau since the inception of the bureau in 1947. The predecessor of the bureau was the mosquito control section. I had several years' service in the Army in malaria control in the Southwest Pacific area. I was employed by the State health department previously on mosquito control consultation service and prior to that time in general environmental sanitation activities in local health departments.

Mr. KLEINFELD. Generally speaking, what does the bureau of vector control do?

Mr. PETERS. It has two types of activities. One is the consultant or advisory service to local agencies which actually perform control of vectors. Generally we think of vectors as the transmitters of diseases that effect man and animals.

The other aspect is the evaluation of methods and obtaining fundamental facts to improve control of these vectors.

Dr. MILLER. In that case, would it be so broad as to say poison ivy was a vector? It transmits to man a disease which is pretty irritating sometimes.

Mr. PETERS. Poison ivy is not classed in strictly vector-borne diseases, in that there is not an organism involved. We generally refer to those transmitted by arthropods in the vector group.

Mr. HORAN. Carriers?

Mr. PETERS. Carriers or transmitters of disease. Usually humans are mostly concerned but——

Dr. HEDRICK. Typhoid would be an example of that?

Mr. PETERS. A very mechanical example, yes, sir. It can be transmitted by flies in a mechanical sense, but the other usual sense is by actual passage through an insect or other arthropod and then into humans.

The activities of the bureau of vector control are scheduled to include operational investigations, control demonstrations, emergency control programs, and such endemic surveys as may be necessary to maintain a current analysis of the vector-borne diseases in the State. Routine vector control programs in California are conducted by local health departments, mosquito-abatement districts, and by the commercial pest-control industry. The control of sylvan rodents is carried out largely under the direction of the State department of agriculture, based on recommendations from the State department of public health. State subvention funds in the amount of $400,000 per year have been made available each year since 1946 for the control of vector mosquitoes and gnats which adversely affect the public's health.

In order to function successfully, a vector-control program must be based upon sound fundamental principles of epidemiology and applied animal ecology, and upon the judicious manipulation of the environment through engineering. In the course of the past several years there has been a very general tendency to ignore certain of the basic principles embodied in these sciences. We have instead attempted the substitution of immediate, spectacular, and ephemeral control methods for the established, slower, but ultimately more certain measures which can be used effectively to regulate competitive animal populations. The results have been cataclysmic.

The vector-control practices which present the greatest potential for the introduction of toxic chemicals into food crops and their byproducts are probably to be found in the activities of mosquito, fly, and rodent control.

A relatively new problem which has developed with the widespread use of electric insecticide vaporizers for the control of flies and other insects in restaurant and food-processing plants deserves very careful consideration and investigation. Certain studies designed to appraise the value and possible hazards which may accompany the use of these devices are now being conducted by this department.

With regard to the use of toxic materials in the fields of mosquito and fly control, we now have convincing evidence indicating that it will be but a matter of time until the insecticides now relied upon will be virtually useless. In the common practice of mosquito larviciding it is now necessary to use from 4 to 10 times as much DDT per given area as was used 5 years ago to achieve comparable results. The resistance shown by certain species of mosquitoes to several of the newer organic insecticides in some sections of the San Joaquin Valley is even much greater—in some cases several hundred times as great as control strains in untreated areas.

The tables below represent quantitative estimates of the various chemicals in current use by local agencies engaged in mosquito- and rodent-control activities.

Estimated mosquito insecticides used in California, calendar year 1950, and estimated use in calendar year 1951, by mosquito abatement districts and health departments

Type of insecticide	Estimated use 1950	Estimated use 1951
	Pounds	*Pounds*
DDT	283,000	337,000
Toxaphene	107,500	125,000
TDE	33,500	37,500
Gamma BHC	5,800	13,500
Chlordane	1,500	1,725
Aldrin	160	3,400
Pyrethrins	75	100
Diesel oil	[1] 66,000	[1] 77,000

[1] Gallons.

Estimated rodenticides used in calendar year 1950 and estimated use in calendar year 1951 by California health departments

Type of rodenticide	Estimated use 1950	Estimated use 1951
	Pounds	*Pounds*
Squill	750	750
ANTU	100	100
Warfarin	200	200
Ten-eighty	5	5
Cyanogas	50	50

Mosquito production associated with agricultural irrigation practices constitutes a major portion of the State-wide mosquito problem. With the development of the Central Valley project the increased mosquito production potential looms as a most ominious factor, as can be seen from the following figures:

Past and future land and water use in the Central Valley of California

Areas	Estimated land use	
	Average annual acres to be irrigated if water is available	Acres actually irrigated in 1928–34
San Joaquin Valley	4,630,000	2,120,000
Sacramento Valley	1,600,000	520,000
Delta area	360,000	330,000
Totals	6,580,000	2,970,000

Mr. PETERS. The tables show that essentially over 200 tons of insecticides of about eight different types were used during 1950, in our estimation, there being no reliable source for this information. And it is estimated that about 300 tons were probably used in mosquito control activities during 1951.

Mr. MCDONOUGH. Have you found that they actually thrived under these conditions, or has there been an increase in population of these insects?

Mr. PETERS. There has undoubtedly been an increase in population because we are experiencing this great Central Valley development. The Bureau of Reclamation is developing great canal systems to bring water into the valley, and there are numerous other independent projects for the development of water sources throughout the State.

Mr. McDonough. So your increase in the amount of DDT from one year to the other is a combination of both resistance to it and an increase in population of the insect?

Mr. Peters. Correct. A third consideration is the tendency for other practices to be used besides insecticides in the control of mosquitoes.

Mr. McDonough. Which you are recommending?

Mr. Peters. We are strongly urging water management practices.

The rodenticide picture is shown there. We were very surprised at how little was used actually according to these estimates.

You can see the land development there in the lower table. When the Central Valley project is completed it is estimated there will be about 4 million additional acres under irrigation in California. That means many, many more mosquitoes.

Among the more important agricultural crops which are associated with conditions conducive to the production of mosquitoes are irrigated forage crops, rice, and cotton. Of these, the forage crops are undoubtedly the most significant from the standpoint of mosquito production. In like manner, the use of insecticides on these crops offers the greatest opportunity for toxic chemicals to enter the diet of livestock, domestic animals, and man.

Thus, as an example, the outlook for mosquito control becomes one of (*a*) increased population and expanded agricultural and industrial development through greater land and water use, resulting in many new problems and greater areas requiring control; (*b*) continued failure of insecticides through the development of resistant strains; (*c*) further restrictions in the use of toxic chemicals to protect man, domestic animals, and wildlife; (*d*) ever-increasing demands for higher levels of sanitation, public health, and comfort.

To meet this challenge and at the same time avoid the pitfalls which so clearly lie ahead, it appears that we will have to retrace our steps and start working with natural forces rather than against them as we obviously have been doing. This is the aim of the program of operational investigations on mosquito ecology of the Bureau of Vector Control and cooperating agencies. We feel that this approach can and should be applied to all phases of vector- and pest-control work.

Where we have failed to compete successfully as biological constituents of our environment the causes can be traced to our lack of understanding of the environment and the organisms which inhabit it as an organic whole. With our knowledge thus incomplete we tend to blunder along, creating chaos where once there was a semblance of order. The recent history of the use of poisons exclusively in an attempt to exterminate certain competitive animal populations is but one example.

Considering the information which we now possess, it seems clear that a drastic revision of our outlook on vector and pest control must come about. To succeed in this, our aims in the future should develop along the more rational lines of actually making use of the facts and forces associated with the natural regulation of animal populations, and supplementing these only when it is clearly necessary to do so. This will necessitate a very significant increase in our basic knowledge and understanding of natural micro and macro environments and the interrelationships existing between various living and nonliving

components of them. We must look upon the environment and its inhabitants as a whole. This becomes abundantly clear when, for example, we treat one part of it or direct our operations against one species of insect, and in so doing influence drastically other parts or other species, frequently effecting unexpected and undesirable results. There is a need for intensive and careful study in the field so that we may know where the natural control of competitive animal populations is deficient under the conditions man has created and so that we may know where our own efforts should be applied to secure the desired balance.

While it is obvious that we cannot look to chemical poisons alone for the solution to our problems, it is unlikely that we will ever be able to rely entirely upon natural control to keep competitive animal populations in check. In view of this there is, therefore, the need for much more detailed knowledge and comprehensive understanding of the effects of poisons on the various vertebrate and invertebrate animals of medical and economic importance, as well as upon the domestic crops and natural flora, the soil, surface and subsurface waters, fish and wildlife, domestic animals and man—that is, upon the environment as a whole.

Thank you.

Dr. HEDRICK. Any questions?

Mr. JONES. No questions.

Dr. HEDRICK. Dr. Miller, do you have any questions?

Dr. MILLER. I have one or two questions.

Some of these insect enemies of mankind, now. Do these insects themselves have any natural enemies that could be cultivated that might be friendly to man, as is done in the food industry in many instances?

Mr. PETERS. Undoubtedly there are some that additional exploration could possibly bring to bear upon some of our noxious pests.

We have in California a mosquito that from all evidence was probably introduced into this State when ladino clover pasture, that is, pastures including ladino clover, began to be used back in the early thirties. Of course, in other States they may very well have some natural enemies or there may be a physical or chemical reason which regulates the population of this species. This could possibly bear exploration. I doubt that it would provide the ultimate answer to control, however.

Dr. MILLER. In your sense and experience with DDT, do you find that insects, particularly flies and mosquitoes, become resistant to DDT and you are using three or four times as much as you did at one time?

Do you deal with dairy barns in your work, and concern yourself with DDT in milk?

Mr. PETERS. We are not ourselves concerned with that. That is the Department of Agriculture function. But we inadvertently in mosquito control relationships run into it.

Dr. MILLER. Do you know whether California measures permit the use of DDT around dairly barns which sell milk commercially?

Mr. PETERS. To my understanding that is not permitted except when used under very restricted circumstances.

Dr. MILLER. Have you had any experience as to the accumulation of DDT in the soil?

Mr. PETERS. I have had no direct experience in that regard, although the implications are that there certainly is an accumulation taking effect with repeated dosages to the soil. As to how the material survives intact, I am not familiar.

Dr. HEDRICK. Mr. Horan, do you have any questions?

Mr. HORAN. Can not you use ovacides in control of mosquitoes?

Mr. PETERS. That happens to be, as I pointed out, one of our ecological studies by which we are attempting to reach the mosquito in its ova stage. That study is underway at the present time.

Mr. HORAN. We have had ovacides for mosquitoes for 50 years.

Mr. PETERS. What do you mean by that?

Mr. HORAN. My point is that we ought to have reached the point of saturation of knowledge at some point in our experience with the ovacides on mosquitoes, because it is an old subject. And we have difficulty with that. I don't know whether you know what a magic word "research" is, but a study of the Bureau of the Budget indicates that in 1943 we were spending more than $73 millions in Federal research moneys. Today we are spending $2½ billion, the Federal Government, to research something that has been researched to death, like ovacides, in their application to mosquitoes, which began with the studies made by the eminent Dr. Walter Reed.

It seems to me a rather difficult thing to evaluate just what you are going to find out in addition to what we already know. I am not going to ask you for a learned discussion of that, but I just wondered, because up our way we use a little kerosene on stock ponds, and we are building a lot of them in Salinas Valley, in attempts to overcome difficulties there.

I am on the Agriculture Appropriations, and we are building stock ponds and reservoirs near here in California in order to overcome salt water they get out of the wells within 4 or 5 miles of the Pacific Ocean.

Of course, that brings up the problem of mosquitoes wholly distinct from the Central Valley project. But I am convinced that the use of ovacide on those ponds will take care of mosquitoes.

Mr. PETERS. I am afraid I didn't understand you to begin with. Perhaps you refer to larvicides, ones which deal with immature form, because at present there is no accepted ovacide used in mosquito control.

Mr. HORAN. There isn't?

Mr. PETERS. No, sir.

Mr. HORAN. This has to be sprayed on.

Mr. PETERS. The ovacide I mentioned is deposited in the soil.

Mr. HORAN. I am not referring to larvicide, that is something else again. Is it the egg which you use the ovacide on?

Mr. PETERS. The ovacide is used against the egg. It just happens there is such a difference in the development of the embryo within eggs, practically with each mosquito group there has to be a different approach even on ovacides. What I had in mind—this mosquito we have in California actually has 18 generations per year.

Mr. HORAN. We have got experiments going on for 40 years.

Mr. PETERS. This particular subject you touched off here is one we have had to rationalize. We know the chemicals used in most control are not going to be successful long, and unless we get new chemicals that will not be subject to this so-called resistance, what

we'll do then, we don't know. We have no other immediate approaches to use. And the one you say, ovacide, I thought you were referring to something specific.

Mr. HORAN. I was and I still am.

Mr. PETERS. I consider this [indicating statement] to be a practical, economical thing. In other words, I do think it has prospects if we can hit them before they become mosquitoes.

Mr. HORAN. When you are talking about larva, is that something you might want to use stomach poisons on? Is that not correct?

Mr. PETERS. Either stomach or contact.

Mr. HORAN. Or smother them?

Mr. PETERS. Yes.

Mr. HORAN. You do that with oil film?

Mr. PETERS. Yes.

Dr. HEDRICK. Mr. McDonough.

Mr. MCDONOUGH. Do you have any estimates on the crop losses as a result of not doing an effective job in an area that is cultivated and because of the insect resistance to these known chemicals—crop losses as a result of not being able to do it?

Mr. PETERS. Would you be referring to the agricultural yield?

Mr. MCDONOUGH. Yes.

Mr. PETERS. No. I am afraid I am not prepared to answer in that respect.

Mr. MCDONOUGH. I do not mean in dollars and cents. Is it generally very high?

Mr. PETERS. Well, the economics of the thing that I am most concerned about would be the increased amount of cost in operator expense and insecticide expense and the inefficiency obtained thereby, leading to agricultural inefficiency by virtue of so many mosquitoes remaining. They still torment people and reduce the ability to work, for instance, in harvesting crops.

Mr. MCDONOUGH. You mean it reduces the effectiveness of the individual to pick the crop?

Mr. PETERS. Right.

Mr. MCDONOUGH. It does not affect the crop especially?

Mr. PETERS. That is correct.

Mr. MCDONOUGH. I thoroughly appreciate Mr. Horan's reference to this bureaucratic attempt to research and to continue to research without arriving at conclusions, but I also recognize that what he is referring is Federal more than State, and you are a State official.

You have got to do a lot of experimenting. You cannot say this is the answer to the whole thing right now, because you got a different problem the next year; have you not?

Mr. PETERS. We have a rather drastic change taking place in our Central Valley, to be certain.

Mr. MCDONOUGH. Yes.

Mr. PETERS. As a result of the vast development.

Mr. MCDONOUGH. Increase in acreage?

Mr. PETERS. This new mosquito we have not had to contend with in the past has required intensification of our program.

Mr. MCDONOUGH. Generally, I conceive from what you say in your statement you are recommending that you develop predatory insects rather than the use of chemicals to kill them off.

Mr. PETERS. I am saying even more: I am implying that we explore the mosquitoes themselves in respect to their life cycle, their habits. Their ecology is the general term.

Mr. MCDONOUGH. Yes.

Mr. PETERS. So that we can determine whether there are not more vulnerable places and times by which we can reach them, even where resistance is not a factor to contend with—where there is more vulnerability. That is what might be called the biological approach.

But the other approach we are furthering is the engineering approach or the physical approach, in which we feel that more intensified water management, the actual correct use of water, both by way of handling and by way of caring for waste water in an over-all plan, is part of our eventual answer.

Mr. MCDONOUGH. Are you familiar with any pest control of the cotton crop of California?

Mr. PETERS. We inadvertently are required to control pests in cotton in mosquito control.

Mr. MCDONOUGH. How do you do that?

Mr. PETERS. The mosquitoes actually do come out of overirrigated cotton on lands where poor leveling and ditching of the cotton is concerned.

Mr. MCDONOUGH. That is a health measure for the people operating in the cotton field; it is not a control of the pest that affects the cotton itself?

Mr. PETERS. No, not necessarily. It would be incidental, if so. The incidental benefit would go to agriculture, primarily for control of mosquitoes.

Mr. MCDONOUGH. That is all.

Mr. KLEINFELD. I have here a reprint of an article entitled, "The Philosophy of Orchard Insect Control," by A. D. Pickett, Dominion Entomological Laboratory, taken from the Seventy-ninth Annual Report of the Entomological Society of Ontario, 1948. Are you familiar with that?

Mr. PETERS. I don't think I have personally read it; no.

Mr. KLEINFELD. I would like to read one statement here and see whether it is in general line with the comments contained in your statement:

> It has been contended by Nicholson that when an insecticide is first applied there may be a very drastic reduction in the population of the pest it is intended to control. Later, when the applications are continued as a routine, a new balance between the insect and its environment (which now includes the insecticide) is reached, and the insecticide replaces in part other factors in the environmental resistance and is not added to it. This hypothesis is supported by our own experience.
>
> Furthermore, what appears to be even more important is the fact that when a chemical is used for some specific purpose, such as the control of a fungous disease, it may increase the survival potential of one or more pests which were unimportant before the spray was applied. An example of this is the increase in populations of oystershell scale and the European red mite following applications of elemental sulfur.

Is that generally in line with your thoughts as expressed to this committee?

Mr. PETERS. I believe reasonably consistent, yes, in that we are constantly interfering with a normal balance which is created by nature. Sometimes we have insurgence into our pattern that we

haven't had background information on, which we have to find out a little bit more about.

I would say, generally speaking, it is our responsibility to be certain of our grounds prior to applying insecticides, because we may have other avenues of approach that would be even more practical than the insecticide approach.

Mr. KLEINFELD. Let me read the conclusion of this article and see if you are in general accord with it. This is Pickett talking:

> In closing I want to say that we believe the proper approach to the orchard insect control problem, or any control problem, whether plant or animal, is through a complete ecological study of the problems involved. If insecticides are necessary to keep injurious species below the economic level, we must take the trouble to determine the over-all, long-range effect of the chemicals on all the factors in the environment. We are of the opinion that the use of chemicals should be considered supplementary to environmental resistance. If we ignore the methods for the maintenance of population levels which nature has devised through the eons of the past, we are treading on dangerous ground. Where man has proceeded on this basis, his actions have often been highly destructive.

Is that, too, in general line with the thoughts you have expressed here?

Mr. PETERS. That is essentially true. To which I would add that there are certain physical preparatory supplements that go hand in hand with environmental control which are beneficial, generally speaking, to the whole agriculture. Our interests are those of keeping inside the demands of agriculture and at the same time accomplishing the effective control of the noxious insects that affect man.

Mr. KLEINFELD. Let me read one more statement.

Mr. HORAN. May I come in before you leave that? He wants to balance pest control against the general economics of the industry, I gather from Mr. Pickett's conclusion there, and he mentions certain pests that he wants to control, among them oystershell scale, which must be distinguished from San Jose scale. Is it not true, Mr. Peters, that the application of the caustic spray, which is a contact spray in the dormant stage, is beneficial not only to the tree but to the soil, and also eliminates one of the pests entirely, and tends to help control even some of your fungus if applied at the right time? So we have already, and we are familiar with the use of one spray that fits into the pattern that he decrees there.

Mr. PETERS. I probably had best not give you the impression that I am competent to answer that question.

Mr. HORAN. Then I will make that as a statement.

Mr. KLEINFELD. There is one last quotation on which I would like to have your view. This is from an article entitled "Insects and Human Affairs," by Dr. V. B. Wigglesworth, Unit of Insect Physiology, Agricultural Research, Cambridge, England. He concludes as follows, and I quote:

> The best hope lies in compromise. There is great scope for discovering just what the insecticides are doing. Just how they are impinging upon the complicated fauna of the apple tree, for example. When we have this knowledge perhaps we shall find it wise to relax some of the chemical pressure and replace some of the more potent chemicals by others with a milder action. In this way we may be able cautiously to encourage the beneficial insects to multiply. We may well find that in the long run an insecticide which kills 50 percent of the pest insect and none of its predators or parasites may be far more valuable than one which kills 95 percent of the pests but at the same time eliminates its natural enemies. Perhaps this is where the future of chemical insecticides lies, not as a substitute for but as a supplement to the more subtle and more remunerative methods of biology.

Is that, too, in general line with the statement you have expressed to this committee?

Mr. PETERS. I think that is true in the concept of agricultural insects, as I understand them. I think it is best to qualify that with respect to mosquitoes. There we are dealing with an insect that has a very terrific reproductive potential, and it is through man's actions that we are enhancing its potential. Some of the agricultural practices or malpractices are actually paving the way for these insects to come forward and to not be arrested by natural forces. There is a need for some interception in such a case in order to be able to quell the potential they have realized thereby.

Mr. KLEINFELD. This committee knows, of course, that there have been hundreds, perhaps thousands, of publications concerned with the use and effects of chemical controls. Are you aware of any publications dealing with educational methods of biological control?

Mr. PETERS. Well, I would certainly be inclined to refer you to the University of California experimental work which has been continuously carried out at Riverside, Calif., where they undoubtedly are publishing information. As to what specific publications, I wouldn't know, but I would think their entire series would be worth including or having considered.

Mr. KLEINFELD. Offhand you do not know of them, do you?

Mr. PETERS. Well, I know of the whole group of work that has been done, but I am not immediately conversant with it.

Mr. KLEINFELD. That is all.

Dr. MILLER. If I may say—hurry along with your research work so our colleagues will feel that something is being done. Of course, if we never had research work, man still would be living in the Stone Age, because research is nothing more than seeking answers of nature and asking questions of the unknown and coming up with an answer.

I think you are in a very important field, and the faster you can work the more inclined I am to think you might be ahead of the insects. If they ever get ahead of us once, they will control us.

Mr. PETERS. I do want to make one statement in that regard—that we are not doing research in the basic sense of the word. Ours is entirely operational investigations that are slanted toward improved economy in vector control, and if we can't justify our program on that basis, we don't have even a leg to stand on.

Dr. HEDRICK. Thank you very much. You have been an excellent witness.

Mr. PETERS. Thank you.

Dr. HEDRICK. Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Hoskins.

(The oath was administered by the chairman.)

TESTIMONY OF W. M. HOSKINS, PROFESSOR OF ENTOMOLOGY, AGRICULTURAL EXPERIMENT STATION, COLLEGE OF AGRICULTURE, UNIVERSITY OF CALIFORNIA, BERKELEY, CALIF.

Mr. KLEINFELD. You are Dr. Hoskins?

Dr. HOSKINS. Yes.

Mr. KLEINFELD. You are professor of entomology, Division of Entomology, Agricultural Experiment Station, College of Agriculture, University of California at Berkeley?

Dr. HOSKINS. That is right.

Mr. KLEINFELD. Are you a pharmacologist?

Dr. HOSKINS. No.

Mr. KLEINFELD. You are an entomologist?

Dr. HOSKINS. I am a chemist by formal training, worked in the field of entomology, particularly insecticides, for the last 22 years.

Mr. KLEINFELD. Will you please read your statement?

Dr. HOSKINS. I was asked by Representative Delaney to prepare a summary of a rather lengthy statement which I filed with the committee. As I understand it, then, you would prefer I read this summary?

Dr. HEDRICK. You may read the summary, and the full statement will be placed in the record.

Dr. HOSKINS. The agricultural workers and organizations of the West have reason to feel grateful to the members of this congressional committee who have made the long trip to the Pacific coast in order to obtain a first-hand view of conditions and procedures in this region.

The magnitude of losses to pests and the genuine impossibility of meeting the Nation's needs for food and fiber have been stressed by so many witnesses that repetition seems unnecessary except to point out that crops and their attendant pests in this State, and the high quality required both for interstate shipment and for the local markets, make pest control a matter of the utmost urgency. Study of the testimony before this committee and the questions asked by counsel and by some members of the committee indicates a feeling that the introduction of a new pesticide is a somewhat haphazard procedure and that the restrictions appropriate for regulation of new drugs can be applied without substantial change to new agricultural chemicals. In the short time available, I wish to address my remarks to these two subjects, which in reality are very closely related.

Many governmental, institutional, and commercial laboratories are engaged in testing new chemicals as possible insecticides. This small-scale work done on a limited number of insect species is called screening and reveals many hundreds of promising pesticides every year. However, the discovery of toxicity toward one or more pests is only the first short step on a very long road that leads ultimately to successful use of a minute percentage of the chemicals that pass this first screening. Trials first on greenhouse scale, then on small plots in various parts of the country, if successful, lead to cooperative tests with selected expert farmers who try the material in various formulations first on small plots and then on commercial plantings. This is a critical point, for all that has gone before is meaningless if the material does not perform creditably in the hands of practical farmers and all planning for future commercial production must be held in abeyance until the farmers' verdict is in. The Federal and State agricultural authorities place great weight on practical results when they decide whether a material shall be licensed for sale. As a rule, Federal, State, and/or university entomologists are closely associated with these trials, especially when they reach the field stage.

The criteria that determine the usefulness of an agricultural chemical, including pesticides, are more varied and exacting than those governing any other use. The truth of this statement may be established by mention of some of them. Thus, a chemical used on agricultural crops is not applied to one species of insect but to the whole

complex of organisms present in any field or orchard. Some are harmful but many are helpful and serious injury to the latter, for example, honeybees or predators such as ladybird larvae which feed upon many harmful insects, is sufficient reason to reject the chemical. The intricate balance among many kinds of organisms is important for many reasons and any marked disturbance resulting from use of a new chemical calls for very detailed investigation before this use may be continued. Most pesticides are used on or about growing plants and any interference with their normal development, set of blossoms or development and ripening of fruit cannot be permitted. Similarly, materials used on or around animals must be free from objectionable effects.

To secure uniform distribution, pesticides are almost always formulated, for example, mixed or diluted with one or several other materials. No deleterious interaction such as destruction of the insecticidal compound or formation of a phytotoxic degradation product can be permitted, either rapidly or after storage for prolonged periods under all manner of climatic conditions. Different crops require application by different methods, for example, orchards are usually sprayed, whereas field crops are usually dusted either from ground machines or from planes. These practices are based upon accumulated experience and a new chemical must prove its adaptability to the various methods of use.

Since pests occur wherever agriculture is practiced, it is obvious that pesticides must be effective under a great variety of climatic conditions, such as the dry summers of the West and the moist summers of the East, or the warm days and cool nights of mountainous regions and the continuous heat of many parts of the South. Temperature, humidity and rainfall, wind, and sunlight affect the stability and persistence of the chemical directly and also the physiological state of plants to which it is applied. The presence or absence of dew or of salty spray carried far inland from the ocean often determines whether a given pesticide can be used in a certain region.

In a similar manner the soil type determines the rate of decomposition of a pesticide after it reaches the ground and thus influences the accumulation during successive seasons of use. The amount of rainfall or irrigation is very important in leaching chemicals from soil or in moving them from one layer to another. This is intimately related to the effect upon plants growing in the contaminated soil.

Several of the processes mentioned develop only after application of a chemical over a period of years. This is a very important point for it means that judgment must be withheld until the accumulated weight of experience is obtained after multiplied expenditure of chemical, time, and effort. Two years' use is considered the very minimum and we prefer 5 years before making unequivocal recommendations.

Such extensive and long-continued trials of a new chemical require that considerable amounts of the proper purity be available for testing. In fact, the pilot plants used in making pesticides for testing are often much larger and more expensive than the total facilities needed for commercial production of drugs. Modern synthetic pesticides are complex chemicals which are made by a series of reactions under precise control. If the cost of manufacture, or of formula-

tion, or shipping, or of application proves to be out of proportion to the benefit derived by its use, as measured in net profit to the farmer, the most promising pesticide is completely useless. This is in sharp contrast to drugs which will be bought cheerfully by anyone to restore his health or that of his family, irrespective of the cost.

The numerous expensive and time-consuming procedures that have been described hurriedly may be called, collectively, agricultural testing. Much more is involved, however, in launching a new chemical. In order to determine quality of a product, methods of analysis must be developed. These often offer considerable difficulty, which is greatly magnified when traces of residual chemical are sought on plant or animal tissue. Satisfactory methods are not available for all the pesticides now in use, but usually the analysis is sufficiently developed for use during the time of agricultural testing so it can be applied to residue determination by the time usefulness as a pesticide is reasonably certain.

The Federal Department of Agriculture and the State agricultural experiment stations are charged with responsibility for agricultural research and they naturally play important roles in the various developments which I have been outlining. Eventually recommendations for use of a pesticide with appropriate warnings of difficulties and dangers are made by the entomologists of the various agencies and these are very influential among practical farmers. Therefore it is a matter of much importance that recommendations should not be made hastily or upon the basis of unconvincing information.

A few examples drawn from the work of entomologists of the California Experiment Station will illustrate the care that is taken in arriving at recommendations. Thus DDT has been tested by many hundreds of workers in all parts of the country, but two seasons' work in 1944 and 1945 by 18 members of the staff amounting to about five full man-years, was put upon this one chemical before it was recommended for use in California. A similar effort was made with parathion in 1946 and 1947. Each field entomologist tested these materials against pests on the crops for which he is responsible and his verdict was arrived at after considering the following five questions: (*a*) Is there necessity for improving the control secured with materials now in use; (*b*) does this new material give better control without harm to plants, impairment of flavor, or keeping quality of products or serious injury to beneficial insects; (*c*) will an effective program of pest control be cheap enough to justify its use; (*d*) is application safe for the operator, persons living in the neighborhood or passing by on the highway; and (*e*) is the residual contamination low enough to offer no hazard in the opinion of the toxicologists who have made tests with animals?

These same criteria are used for chemicals tested in the course of a study aimed at improving the control of a given pest, rather than at finding the limitations of a given chemical as in the instances of DDT and parathion. Grapes are an immensely important crop in this State. For many years Dr. L. M. Smith of the experiment station at Davis has been working on control of grape pests and when the so-called Pacific mite began to cause great losses about a dozen years ago he started to search for better pesticides. The standard remedy for mites on grapes is sulfur but this does not do a satisfactory job

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with the Pacific mite. During the past 6 years Dr. Smith has tested 41 materials, proceeding in each case from very small plots to larger ones and eventually to full-scale farmer-conducted use with those that proved practical. Among the 41 materials, 5 have survived the criteria for at least 3 years and are widely used. The other 36 failed for various reasons—17 were not effective, 5 injured grape vines and 3 caused bad appearance or off-flavor of the grapes or products from them, 3 were dropped by the makers because of expense or difficulty in manufacture, 3 were too hazardous to the user or left excessive residues and 5 have not been tested long enough to make a decision.

A second example concerns protection of seedling plants from two soil-inhabiting pests. Very many vegetables and field crops are attacked soon after they germinate by wireworms—larvae of a beetle—and by seed-corn maggots—larvae of a fly. Previous methods of control have been rotation with crops which are not attacked, summer fallowing of the fields, use of poisoned baits, injection of fumigants into the soil, and harrowing in of DDT or other chemical applied broadcast over the field. None was entirely satisfactory. Dr. W. H. Laage, also of Davis, found that benzene hexachloride was effective but that the amounts needed for general application over the field gave a musty taste to many plants. In 1946 he first experimented with aplication of BHC to the seeds only at planting time. This reduces the amount needed from a matter of a pound or more per acre to a fraction of an ounce and greatly reduces the cost of application. No contamination has been found after several years' use and there appears to be no accumulation in the soil. This seed treatment has assumed enormous size—one sugar beet company alone has treated over 600,000 pounds of seed with purified BHC and lima bean seed for 20,000 acres have been treated for each of the past 3 years in Sutter County.

Since licensing for use and the level of contamination to be permitted depend equally upon the results of the agricultural testing, the toxicological testing and the residue analyses, manufacturers of new pesticides attempt to keep the three activities abreast so there will be minimum delay in securing approval for commercial use. Not only are all three kinds of testing necessary but they are mutually dependent in the sense that there is no use in continuing the agricultural testing of a chemical if it is too hazardous in application or leaves a persistent residue that exceeds the safe level for long continued intake by consumers. Neither is there any point in continuing the toxicological testing of a chemical which fails in its agricultural use.

Those who have advocated that a new agricultural chemical should be completely tested for safety before its agricultral testing is carried to the decisive point of use on a commercial scale, have invariably been well-intentioned persons with nonagricultural experience who do not realize that the enormous process of evaluating for usefulness from the agricultural aspect cannot be stopped and held in a state of suspended animation without imposing an impossible situation upon the chemical manufacturers, the formulators and distributors and the agricultural scientists who conduct and supervise the field trials.

This is especially the case because toxicologists have difficulty in deciding when safety has been established. In a strict sense, no pesticide is automatically safe for use without restriction and the point

in question is always what amount can be permitted as a residual contaminant. The FDA has been very reluctant to set these tolerances even when an enormous number of people had been exposed to the chemical in question as witnessed by the delay of several years with DDT. It is safe to predict that if a decision had to be made for a chemical which had never reached field trials and hence had not appeared as a residue on food which people ate, the FDA would be extremely reluctant to set tolerances on the basis of animal tests alone.

The actual circumstance which has come about with each of the dozen or so pesticides introduced since DDT is that acute toxicity is determined by the time that small plot trials are made and tests for chronic effects have proceeded for a year at least by the time of field trials by selected farmers. This is the natural consequence of the program of simultaneous agricultural and toxicological testing. There is very real merit in the simultaneous development of agricultural and toxicological testing for two reasons: (1) The use of considerable amounts in the farmer-conducted trials means that numerous persons are exposed to the chemical during the successively larger stages of use and a limited amount of treated food is consumed. Hence the toxicologist has a background of human exposure as well as animal testing when he comes to the decision point and he also has available data on the amount of residue resulting from practical use. Since the introduction of the material starts on a very small scale, the possibility of serious injury to humans is kept at a minimum; (2) the manufacturer can base his decision on whether to go head, with full knowledge of the performance of his material rather than with only indications from trials on a minute scale, and agricultural officials are in a position to make recommendations with minimum delay.

It will be obvious that the problem of testing a new agricultural chemical bears little resemblance to that of evaluating a new drug. The varied conditions of use, the effects of climatic factors, the immense number of affected organisms, the variation in results with the seasons, the immense quantities concerned, the great expense required to even launch a material for test and the necessity for evaluating cost in terms of economics rather than in terms of health or even life—all these and other factors serve to distinguish agricultural chemicals from drugs so sharply that it is foolish to try to fit the two groups into the same pattern.

The existing method for licensing new agricultural chemicals and regulating their use divides responsibility between the Department of Agriculture and the Food and Drug Administration. In my opinion this provides a check and balance in accordance with our traditional theory of government. There is one discordant feature, however. No third agency is charged with responsibility for providing the data on hazard to man and animals resulting from use of agricultural chemicals. Instead the FDA has been forced to try to supply these data and thus must combine two functions. It would be preferable for the toxicology section of the FDA to be transferred to the Public Health Service, given increased facilities and be charged with complete responsibility for rendering expert opinions on all matters relating to hazard from chemicals used in agriculture and in industry. In order to ensure proper coordination, a group of technical experts represent-

ing these three divisions of Government, agricultural organizations, the public and possibly other groups should have a supervisory function, with the specific duty of attempting to anticipate problems before they become emergencies. Since nothing is more important than food, the very staff of life, we surely can afford to spare no effort to see that it is abundant, nutritious and as reasonable in cost as possible.

Dr. HEDRICK. Does that conclude your statement, Doctor?

Dr. HOSKINS. It does.

(The prepared statement submitted by Dr. Hoskins follows:)

STATEMENT OF W. M. HOSKINS, PROFESSOR OF ENTOMOLOGY, DIVISION OF ENTOMOLOGY, AGRICULTURAL EXPERIMENT STATION, COLLEGE OF AGRICULTURE, UNIVERSITY OF CALIFORNIA, BERKELEY, CALIF.

The size and complexity of California's agriculture cause nearly all problems of pest control to be encountered here, many in acute form. Technical employees of the Federal and State Governments, the university and numerous manufacturers are actively seeking improved cultural practices, more efficient machines and better chemicals. Probably nowhere else can all phases of pest control be studied so advantageously. It has been a great opportunity to have a small role in the work with several new insecticides during the last few years. Since the magnitude of the task of testing a new compound for usefulness in our problems has a bearing on the question of the restrictions which may or should be imposed, it will be worth while to briefly recount our experience with some of them. I will speak only for the local group of entomologists in the University of California at Berkeley and Davis, but equally extensive work is carried out in southern California at the citrus experiment station, as well as certain similar work of the State department of agriculture and several insecticide manufacturing companies.

As my first example take DDT. It was in 1942 that we first heard of a mysterious compound X whose name and composition were supposed to be military secrets, though of course it had originated in Switzerland and the Germans knew far more about it than anyone in this country. After some delay the method of synthesis was divulged and I made what was probably the first DDT in California. It was unbelievably toxic to flies, ants, and other common insects—unbelievable, that is, compared to the materials with which we were familiar, and the persistent effects were beyond our previous experience. The great risk in handling it was stressed in all reports passed out from the Federal authorities, but before long we heard of hundreds of thousands of Neopolitans being liberally dusted for louse control and returning servicemen from the Pacific told how it was impregnated into clothing and in general spread around like so much chalk. Nevertheless when a supply finally became available, it was treated with great respect at first. I feel that the exaggerated precautions urged upon farmers when they first used DDT generated a scepticism of warnings that led to carelessness later with some truly dangerous materials. It was a case of crying "wolf" too soon.

Small amounts of DDT were available for agricultural trials in 1944 and much more in 1945. During that year 18 members of the local staff worked on DDT, trying it on 17 kinds of insect pests, some 30 species in all, on a dozen crops, in about 15 northern counties of the State. Five different formulations were used, each at several concentrations or amounts per acre, and four methods of application were used, i. e., round-spray rig, ground duster, ground vapo-sprayer, and airplane dust. Analyses for residual amounts were made on seven different kinds of crops. The total effort amounted to about five full years for one man and the cost was not less than $30,000. The results have been published in Circular 365. All this was for one compound during 1 year by university personnel in northern California only. Other groups such as Federal entomologists were trying DDT versus grasshoppers; State entomologists were testing it on Mexican bean beetle and other insects and the mosquito-abatement men were applying it to several kinds of mosquitoes. All this was duplicated in volume but on other pests in southern California. Since then the work has been extended greatly so that practically every insect pest in the State has been tested. To varying degrees this story has been repeated in each State of the Nation and in every country of the world.

To show that DDT is not an exceptional situation, I may call attention to the effort that was made with parathion. In 1947 the field men of the division of entomology made a cooperative study of this material, using about 30 different species of pests, several formulations and methods of application to 10 field crops plus many greenhouse plants. The effort was similar to that with DDT. The results have been published in California Agriculture, volume 2, No. 4, April 1948. Within the last 3 years some dozen newer chemicals have been brought out and to the limit of our time and ability have been tested on our pests.

The reason for giving these details of the work with two chemicals was to call attention to what the agricultural testing of a chemical really means. Possibly the thought may occur to some that really large sums of money should not be spent in this State each year in trying to find if one chemical is better suited than another to our needs. The answer is that all research in agriculture is trifling in comparison with the value of our crops. Thus all the work on DDT is more than paid for every year by the increased production of alfalfa seed or the economy in producing apples and pears with codling-moth control by DDT instead of lead arsenate. I wish to emphasize that agricultural testing of a new chemical involves its effects upon many kinds of insects, singly and in all manner of combinations. Some are harmful but many are helpful in that they destroy some of the harmful ones. Hence methods of use must aim at harming these beneficial insects as little as possible. The majority of pest-control chemicals are used on or around plants which react in varying ways. A wide variety of climatic conditions are involved, especially in California, where commercial crops are produced over a range of temperatures, humidities, and wind conditions. These all affect the stability and lasting properties of pesticides and hence tests must be replicated in different regions. The numerous types of soil and variations in degree of salinity and acidity of water in different regions similarly affect the behavior of agricultural chemicals. Success in protecting a crop often depends upon application at one or more precisely determined times.

Different formulations, i. e., mixtures or dilutions in which the active chemical is combined, act differently and different methods of application, e. g., as spray or dust from the ground or from the air offer advantages and disadvantages that must be compared. Repetition through several seasons is necessary to eliminate the effects of climatic fluctuations and to establish the effect on the biological balance between harmful and beneficial insects. And over all hangs the vital condition that a profit in terms of higher yield of marketable produce must result or the whole program of pest control is a loss from the farmers' viewpoint. Even with subsidies and guaranteed prices, agriculture is still a business proposition very much subject to the whims of nature. Proof is abundant that it is impossible without control of pests and few people are so foolish as to debate that point.

Consideration of all the factors just mentioned by no means covers all the matters that must be taken into account before recommendation of a given chemical is made. The entomologists of the California Agricultural Experiment Station base their decisions upon five major points, (*a*) necessity for better chemical control, (*b*) effectiveness of the new material, (*c*) reasonable cost of a satisfactory program, (*d*) safety during application, and (*e*) residual contamination at harvesttime. To secure data on contamination, which is especially pertinent to these hearings, the university has chemical laboratories in Berkeley and in Riverside which do a very large number of analyses of produce from both commercial and experimental plantings.

As each season's work is ended each field entomologist of the agricultural experiment station brings together the data from his own work, the residue data and any available information from other workers in order to improve the recommendations for control of the pests that come within his responsibility. For several years the most uncertain factor in the whole picture has been the lack of tolerances or permitted degrees of contamination for the new organic insecticides. The FDA has been very loath to set these tolerances. One reason doubtless is the memory of the lead arsenate fiasco about which the committee has heard considerable in the State of Washington. It is to be hoped that the very extensive and very expensive hearings held last year will enable the FDA officials to set tolerances for several important chemicals, but some simpler system must be devised or the same confusion will continue with respect to chemicals that have been introduced since those hearings. This situation is very important in relation to any proposal for change in the system of licensing a new agricultural chemical. Experience shows that most candidate pesticides fail in practical

tests. Dr. McNew has estimated in his testimony a few months ago that 80 percent are dropped after a season or two. Hence much of the effort needed in testing all of them in animal feeding experiments would be wasted. Since facilities obviously are inadequate for determining the hazard to consumers of the relatively few chemicals which reach large-scale use under the present arrangement for testing, it is clear that the far larger number for which serious agricultural testing is justified could be given reasonably speedy feeding trials only if an astronomical expansion of toxicological facilities and experimenters was provided. This is especially the case since long-term tests for chronic effects are often more important than short-time tests for acute toxicity.

This committee has listened to many notable authorities discuss this subject of chronic toxicity more ably than I could do, but one point may bear repetition. That is since man is the species whose well-being is of most concern in this matter, only by long continued and extensive tests on humans can really unchallengable data on toxicity be obtained. Dr. Wiley recognized this point when he tried several food preservatives on his famous "poison squad" in the early years of this century, but for the sake of simplicity and economy the great bulk of such tests are conducted on small animals with the pious hope that as a rat reacts, so will a man react. This seems to an entomologist to take much for granted since we have many examples of very closely related insects and mites which differ strikingly in susceptibility to insecticides. One example is the two hornworms which are pests on tomatoes in California. The tomato hornworm, *Protoparce sexta*, is difficult to kill with DDT, while the tobacco hornworm, *Protoparce quinquemaculata*, which only an expert can distinguish from the other, is highly susceptible.

The written record of the hearings of this committee quotes several toxicologists and nutritionists to the effect that tests on humans are of more value than those on rats, e. g., Drs. Hayes, McCay, McNew, Neal, Newton, Princi, and Smith. Several toxicologists experimented on themselves in the early work on DDT but this is not feasible as a routine practice. Use of prisoners in penitentiaries has been suggested and some valuable dental experiments have been conducted in this State with prisoners at San Quentin. On account of the controlled diets and specialized population in penal institutions, such tests throw but limited light on what would happen with the general public. The really significant test is to feed a considerable amount of naturally contaminated food to a numerous group of people, taking care to duplicate the technique used in testing a new drug, i. e., starting with very small amounts and increasing until some effect is noticed or it is reasonably certain that none will develop. How can this be done? It is already being done in an unplanned way with every new agricultural chemical. Since the progress in testing a pesticide proceeds from small to larger use, the amount of such treated food increases through a period of years if the pest control is satisfactory. In the early stages contaminated produce makes up only a minute fraction of the total, so the danger of injury is minimized in exactly the same way that small doses of a new drug lessen the probability that a patient under treatment will be killed or injured by it.

There is then an important purpose served by use of new materials on an increasing scale while their practical utility is being determined. If the produce involved in these tests could be put into the commercial market in definite areas under the guidance of State and Federal marketing authorities and if the medical association and public health officials made a special point of watching for any unfavorable symptoms among the populace the resulting information would be highly significant by the time the agricultural testing was completed. This would avoid the considerable period which now intervenes before data on human reactions are available to back up or disprove the animal results. This suggested procedure bears a strong resemblance to the program for testing enriched bread in New York State or adding fluorine to the drinking water to test its effectiveness in preventing tooth decay. Of course, lifetime tests with short-lived animals should be run before or simultaneously. The special point is that complete prohibition of practical use until chronic tests had been made on animals would mean that evaluation on humans was still to be done and the whole question of real usefulness upon which manufacturers must decide to lay out huge sums for plant expansion would still have to be determined.

The idea that an agricultural chemical can be tested completely for hazard before wide use is made of it is very attractive at first sight but in reality is highly impractical. In the absence of information on how much may be expected to remain on treated produce, the experimenter must assume some level

of contamination. Thus various workers have fed rats with diets containing several hundred parts per million DDT and have found various pathological conditions after a time. Such results serve only to indicate that the chemical can do harm but have no bearing on the effect of the material at the levels which occur in practical use. Similar tests with exaggerated amounts would show that many ordinary articles of diet may be harmful. No useful purpose is served by stressing that a chemical may be harmful under some extreme condition. The question is whether it is too hazardous in practical use and this can be decided only in the light of wide experience in which humans as well as animals are included.

A requirement of exhaustive animal testing before any practical use is permitted would force toxicologists to rely entirely upon results with animals in deciding whether a chemical should be given a clean bill of safety. It is surely easy to believe that under the circumstances, the official who was responsible for issuing a certificate of safety would hesitate a very long time lest humans react differently from his experimental animals. If he certified a chemical for only limited use in order to try it on humans in a small way, that would be exactly what is now done under present regulations and the delay caused by a change in method of approval would do little if any good.

From the point of view of one whose business is pest control, there is little serious harm in slower introduction of new chemicals, for there always have been losses because of pests and there always will be despite every effort to prevent them. The really serious point is a drying up of the supply, brought about by regulations which make the development of a new chemical too expensive. It should be noted that agricultural chemicals in general and pesticides in particular, both in the United States and elsewhere, have almost always been introduced by private individuals or organizations who hoped thereby to build up a profitable business. Governmental scientists and technicians have done excellent work in screening compounds for possible usefulness and in testing those which were made in quantity by industry but they contributed next to nothing toward the essential step of making enough material and putting it in proper condition for use.

It may be thought that present pesticides are meeting the problem satisfactorily and new ones are really not needed. This viewpoint is false for two reasons. First, the increasing demands on agriculture to feed and clothe our expanding population has resulted in the cultivation of much land that yields a profitable crop only when every effort is made to keep losses to pests at a minimum. The increase in destruction by the various mites within the last few years provides an example of how present chemicals are not good enough. At present over a dozen miticides are under extensive commercial testing which could not be done if their entire safety had to be proven first.

Secondly, the ability of various important pests to become resistant to a hitherto effective pesticide has posed a problem of towering magnitude. Already houseflies and mosquitoes in large districts have become resistant to DDT and other chlorinated hydrocarbons. Bedbugs are showing a similar tendency and mites are failing to succumb to parathion. This phenomenon is similar to the well-known development of tolerance toward drugs shown by many pathogenic bacteria and undoubtedly will increase in frequency and degree. The solution is use of new materials, especially those of quite different chemical make-up and these need to be developed from scratch in most instances.

There is considerable danger that some of the statements made in the last few years about contaminants in foods may start a wave of fear among people that their food is a carrier of poisons and that greedy manufacturers and equally greedy farmers are willing to injure the general public for the sake of larger profits from agriculture. Nothing could be further from the truth. All these suspected persons also eat and I have never heard of one of them who demanded a special, unpolluted diet. Actually, nature has not been careful to produce human or animal foods that are free from injurious constituents, as illustrated by the selenium in wheat from several Great Plains States, arsenic in oysters and other sea foods, oxalic acid in rhubarb, hydrogen cyanide in the seeds and pits of fruits such as almonds, fluorine in drinking water, and many different kinds of alkaloids in plants and fungi such as toadstools that appear entirely edible.

A brief recapitulation of the points in this report may be made as follows: Under the present regulations governing agricultural chemicals new materials are introduced gradually so that the reaction of humans to contaminated foodstuffs may be watched before these make up more than a small fraction of the

total food. As a matter of fact, most of our food is completely out of contact with any pesticide. This gradual introduction of a chemical into the human foodstream provides much more pertinent data than could be obtained from any amount of animal testing for nearly all toxicologists are in agreement that animal feeding is only a prelude to actual use in human diets. This permits the most prompt evaluation of their important role in providing food that is wholesome from all points of evaluation, including the absence of harmful incidental constituents. New pesticides cost a great amount of time and money to develop. They have been brought out almost exclusively by private industry which is in harmony with our national tradition of individual initiative. Lastly, new pesticides are needed to enable agriculture to meet the demand for more food and fiber and especially to overcome the problem presented by development of pests resistant to chemicals now in use. The need is not for increased restrictive legislation but for increased coordination of efforts. The numerous committees now looking into the matter of chemicals in food are proof of a lively and healthy interest in this important matter. If the advice of a disinterested group of distinguished agriculturalists, entomologists, food processors, chemists, physicians and toxicologists could be sought by the officials of the USDA regarding the licensing for use of new agricultural chemicals whose hazardous nature is in doubt, the decisions of these harassed officials would be more reliable and unnecessary fears of the public would be allayed. Perhaps the Committee on Foods of the National Research Council can undertake this function.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. You mentioned one thing there. You said, following these tests the insecticide could be given approval for commercial use. You were referring to approval by whom?

Dr. HOSKINS. That would be the licensing for interstate commerce or use within the State as we have in our local arrangements.

Mr. JONES. In other words, that is licensing by the Department of Agriculture?

Dr. HOSKINS. Yes. There is a distinction between licensing for experimental work which is regularly done and licensing for general use without restriction. I am speaking of the latter.

Mr. JONES. You are speaking of approval for commercial use?

Dr. HOSKINS. Yes.

Mr. JONES. That would be Department of Agriculture licensing then?

Dr. HOSKINS. That is right.

Mr. JONES. That is all.

Dr. HEDRICK. Any questions?

Mr. HORAN. No questions. It is an excellent statement.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. I agree that you cannot compare the investigation of the toxicity of a poison in an insecticide with the same test you have applied in the use of drugs. But what tolerance should be established for a new chemical used in insecticides which may have an effect on an individual?

Dr. HOSKINS. It is rather interesting that among all the chemicals that are now in actual use, none of them leave a deposit, residual deposit, of more than approximately five parts per million. That is just a rule of thumb, of course.

Mr. MCDONOUGH. You are talking about the residue of the product?

Dr. HOSKINS. Yes.

Mr. MCDONOUGH. I mean the effect it has on the man working in the field, the health of the individual, the operator. Where would you draw the line as to how extensive it should be investigated before he may become a victim of poisoning from it?

Dr. HOSKINS. My point in presenting the argument for the simultaneous agricultural and toxicological testing is that the two supplement one another, and during the course of the agricultural testing a great deal of valuable information is obtained of a toxicological nature.

The point you are raising of the effects on the applicator can only come out when large-scale application is done. You can't possibly figure out what would happen in commercial use of material by applying it to a 10-foot-square plot or something like that. It has got to be done on a big scale before you can get this information.

Mr. MCDONOUGH. In other words, you know it is poisonous to begin with, because it is going to be used to kill off the insect affecting the fruit or the vegetable, but you don't know what effect it will have on the man who is applying it after he is in that atmosphere for a whole day or a week or 2 weeks?

Dr. HOSKINS. We don't, and we never can find out except by trying it.

Mr. MCDONOUGH. There was someone testified just before you that there was some 300 cases in the last year.

Dr. HOSKINS. That is right.

Mr. MCDONOUGH. In other words, do you find it affects some people one way—it is deleterious to one and not to another?

Dr. HOSKINS. That is true, very true. From my own experience I have seen that. For instance, I am very sensitive to nicotine. It gives me a tremendous headache. A friend of mine, generally about the same as I am, same age, could expose himself all day to nicotine fumigation and never have it bother him.

Mr. MCDONOUGH. In addition to the Department of Agriculture in the State of California, what does the Department of Labor have to say or do about such industrial hazards as that?

Dr. HOSKINS. I wouldn't express an opinion. That is out of my line.

Mr. MCDONOUGH. You don't know?

Dr. HOSKINS. They do have certain authority.

Dr. HEDRICK. Mr. Kleinfeld.

Mr. KLEINFELD. Dr. Hoskins, the committee asked you to prepare a summary of your statement. Was that the summary or new material?

Dr. HOSKINS. It is a summary with emphasis on what I considered to be the most important point in my statement.

Mr. KLEINFELD. How much new material would you say you have in your statement?

Dr. HOSKINS. Perhaps a couple of pages.

Mr. KLEINFELD. On page 1 of your original statement you say, and I quote:

> I feel that the exaggerated precautions urged upon farmers when they first used DDT generated a skepticism of warnings that led to carelessness later with some truly dangerous materials. It was a case or crying "Wolf" too soon.

Dr. HOSKINS. Yes, sir.

Mr. KLEINFELD. Are you familiar with the fact that for a considerable time DDT was used and recommended for use on cows and in dairy barns?

Dr. HOSKINS. Oh, yes.

Mr. KLEINFELD. But they are not using it now, are they?

Dr. HOSKINS. No.

Mr. KLEINFELD. Would you call that a case of crying "wolf" too soon?

Dr. HOSKINS. That is not the situation I had in mind. When DDT first came on the horizon I made the first samples in California, by the way, and we tried it in laboratory tests. Then when certain amounts became available, the most elaborate warnings were issued—"Keep this off your skin. Don't breathe in its neighborhood," and all sorts of things. These were passed on to the public. At least they got out.

It is referring to that that I made the statement that "wolf" was cried too soon. You are raising an entirely different question, namely, that upon the advice of toxicologists of the Food and Drug Administration and other organizations it was considered safe to use this material around dairies.

Mr. KLEINFELD. Was it not recommended by the Department of Agriculture?

Dr. HOSKINS. Upon the approval of the Food and Drug Administration.

Mr. KLEINFELD. Did the Food and Drug Administration say, "We recommend the use of DDT on dairy cows, in dairies"?

Dr. HOSKINS. If you read the testimony of Dr. Bishopp, you must have seen it. You must have heard it.

Mr. KLEINFELD. I heard it.

Dr. HOSKINS. It goes into that very thoroughly.

Mr. KLEINFELD. It is my understanding that various State and Federal bureaus dealing with insecticides recommended DDT for all these purposes; is that not correct?

Dr. HOSKINS. That is correct.

Mr. KLEINFELD. They are not recommending it now for use in dairy barns and on dairy cows?

Dr. HOSKINS. That is right.

Mr. KLEINFELD. Isn't it a fact that we learned in the last few years that DDT is stored in the fat of animals, secreted in the milk of cows, and stored in the fat of human beings?

Dr. HOSKINS. Yes. We did some of the work on that.

Mr. KLEINFELD. Did we know that when DDT was widely used?

Dr. HOSKINS. We knew that within about 2 years after it was widely used. All that this illustrates is as new facts are found, recommendations are changed to agree with them.

Mr. KLEINFELD. New facts are found about deleterious effects and then we make them public; is that correct?

Dr. HOSKINS. Perhaps you have in mind if we had held up DDT long enough someone would have fed it to a cow and it would have come out in the milk. Maybe it would have happened and maybe not.

Mr. KLEINFELD. The only thing I have in mind is this—DDT was widely used in dairy barns and on dairy cows.

Dr. HOSKINS. Fairly.

Mr. KLEINFELD. We do not recommend its use now, do we?

Dr. HOSKINS. That is correct.

Mr. KLEINFELD. In testifying before this committee, Dr. Wayland J. Hayes and Dr. Paul A. Neal, National Institute of Health, Public Health Service, said in part very recently to this committee:

Our present knowledge makes it difficult to categorically state the maximum amount of DDT which may be taken by man every day with safety.

Don't you think it would be well to know that sort of information before we use an insecticide?

Dr. HOSKINS. It would be impossible to know that. You would have to feed a man throughout his entire life span before you know that.

Mr. KLEINFELD. Then you don't believe in animal studies, do you?

Dr. HOSKINS. I believe in them very thoroughly, but there is testimony of about eight toxicologists, by my own count, in the proceedings which have emphasized that they are only preliminary to use on humans.

Mr. KLEINFELD. You mean we should rely on tests on humans?

Dr. HOSKINS. Ultimately. Where else will we get the information? Do you act like a rat? [Laughter.]

Mr. KLEINFELD. Only sometimes in cross-examining witnesses. [Laughter.]

Pharmacologists, not entomologists, who have testified before this committee, have unanimously stated that it is absolutely essential in the case of chemical additives, particularly insecticides, to make tests on animals, long-range tests on several species, and that until these tests are completed and it is established that as far as these animals are concerned it is safe, a product should not be used. Do you agree or disagree with that?

Dr. HOSKINS. It is impossible to give a categorical answer to that. If you will define what you mean by "used." It has to be used to perform the experiment on the animal.

Mr. KLEINFELD. Let me repeat. We have had a number of pharmacologists, some of the best people in the United States, testify before this committee. They have said that in their opinion, on the basis of their background and knowledge as pharmacologists, no substance should be used in or on food for human beings, as insecticides or as chemical additives, until exhaustive experimental work has been done on animals, on several species of animals, over the life spans of one or more animals, to determine what effect, from the viewpoint of the pharmacologist or toxicologist, the substance has. Is that clear?

Dr. HOSKINS. Yes.

Mr. KLEINFELD. Do you agree with that?

Dr. HOSKINS. Within limitations. If you are speaking of short-lived animals, then that process is possible. If you insist we should include cows, it would not be possible, because the life span of a cow runs 12, 15, 18, 20 years, and two or three more of them would put the thing off so far it is impracticable.

Mr. KLEINFELD. Doctor, you say this on page 3 of your statement, and I quote:

Since facilities obviously are inadequate for determining the hazard to consumers of the relatively few chemicals which reach large-scale use under the present arrangement for testing, it is clear that before a larger number for which serious agricultural testing is justified could be given reasonably speedy feeding trials only if an astronomical extension of toxicological facilities and experimenters was provided.

Then you say this:

This committee has listened to many notable authorities discuss the subject of chronic toxicity more ably than I could, but one point may bear repetition. That is since man is the species whose well-being is of most concern in this matter, only by long continued and extensive tests on humans can really unchallengeable data on toxicity be obtained.

Is it your viewpoint that we should use the substances on human beings as an experimental piece of work?

Dr. HOSKINS. I tried to explain in the statement I read that this is exactly what would happen if materials are brought into use on a gradual scale. In my opinion there is no substitute for that, and very good proof of it lies in the story of lead arsenate which was tried on animals exhaustively at tolerances set by the Food and Drug Administration, and it proved to be utterly impracticable. On express orders of the Congress of the United States an investigation was made by the Public Health Service based primarily upon humans residing in the State of Washington, and upon the results of that investigation the tolerance was raised fivefold.

Mr. KLEINFELD. I see. Then apparently the heart of your statement is contained in the second paragraph on page 4. Here is what you say, and I quote:

On account of the controlled diets and specialized population in penal institutions, such tests throw but limited light on what would happen with the general public. The really significant test is to feed a considerable amount of naturally contaminated food to a numerous group of people, taking care to duplicate the technique used in testing a new drug, that is, starting with very small amounts and increasing until some effect is noticed or it is reasonably certain that none will develop. How can this be done? It is already being done in an unplanned way with every new agricultural chemical.

Couldn't that be fairly called the human guinea pig approach?

Dr. HOSKINS. I presume so.

Mr. KLEINFELD. How do you think these human guinea pigs feel about it?

Dr. HOSKINS. Why, I believe they would object. Since you want to refer to the testimony of new drugs, no drug is ever given a clean bill of health on the basis of animal testing. It is taken from animal quotas into the clinic and tried on humans. Many don't know they are being used as guinea pigs.

Mr. KLEINFELD. I imagine these humans are asked whether or not it should be used.

Dr. HOSKINS. They don't know whether they are in the control or the test group.

Mr. KLEINFELD. Do they not consent to the experiment?

Dr. HOSKINS. Yes.

Mr. KLEINFELD. Do you not think that is important?

Dr. HOSKINS. Not especially. I am not in favor of trying things out on everybody, but I stick to the point that the program that I outlined, which is actually being done, does bring in this invaluable factor of human reaction in the easiest and least risky way it can be done.

Mr. KLEINFELD. I see.

Now, again you say:

There is then an important purpose served by use of new materials on an increasing scale while their practical utility is being determined. If the produce involved in these tests could be put into the commercial market in definite areas under the guidance of State and Federal marketing authorities and if the medi-

cal association and public health officials made a special point of watching for any unfavorable symptoms among the populace, the resulting information would be highly significant by the time the agricultural testing was completed.

I agree that would be significant, but how about these people in whom unfavorable symptoms appeared? How do you think they would feel about this procedure of yours? Do you think they would like it?

Dr. HOSKINS. The rest of my paragraph goes ahead to point out this is very similar to the testing programs for addition of fluorine to public drinking water, to which some people objected.

Mr. KLEINFELD. Don't you know that the experimental work on the use of fluorine has been going on for about 30 years?

Dr. HOSKINS. I am familiar with that.

Mr. KLEINFELD. And still it is not used all over the country, is it?

Dr. HOSKINS. No.

Mr. KLEINFELD. Some of the chemicals in use now, like DDT, have they been given experimental work for 30 years?

Dr. HOSKINS. Since we have only known about the insecticidal importance of DDT since about 1940, the answer is obvious.

Mr. KLEINFELD. Obvious. But we haven't been using fluorine in drinking water until very recently, and then to a very limited extent.

Dr. HOSKINS. It occurs in natural water, so you have the equivalent of an experiment.

Mr. KLEINFELD. For instance, the State of California does not permit the use of fluorine in the drinking water; is that not correct?

Dr. HOSKINS. You are wrong there.

Mr. KLEINFELD. The State of California permits it in drinking water?

Dr. HOSKINS. The city of San Francisco, right where we are now, had an election on that point about 2 weeks ago and the people voted they wanted their water fluorinated.

Mr. MCDONOUGH. I didn't hear the answer.

Dr. HOSKINS. Right here in the city of San Francisco an election was held about 2 weeks ago and the people voted for fluorination of the water supply. In my home across the bay similarly the question is being debated right now.

Mr. MCDONOUGH. In other words, it was not permitted up until the election?

Dr. HOSKINS. It was left up to the individual people apparently in various districts. I don't know the legal aspects of that.

Mr. KLEINFELD. Didn't the people of Los Angeles reject it?

Dr. HOSKINS. I don't know.

Mr. KLEINFELD. So the people chose whether to use it or not as a matter of their own volition; is that not correct?

Dr. HOSKINS. Well, that means that those that are in the minority have to go along anyway. So a lot of people do this unwillingly.

Mr. KLEINFELD. At least they know what is going on.

Dr. HOSKINS. If it helps any.

Mr. KLEINFELD. You talk about enriched bread. What is in enriched bread that might be in your opinion toxic?

Dr. HOSKINS. I am not an authority on that, but I read the testimony of Dr. McCay, in which he lamented that standardization of bread had introduced an obstacle to the sale of the loaf that he and his associates worked up. He tried this bread in various institutions,

however, in New York State. So he put it on a trial, which is what I am referring to here in my analogy between the introduction of enriched bread there and the introduction of a chemical.

Mr. KLEINFELD. You may not have understood my question, Doctor. Dr. McCay testified before this committee that he wished to put certain substances in bread which he considered very nutritive, and that the Food and Drug Administration would not allow it. He gave us no testimony whatsoever that anything was being used which in his opinion was toxic, either in his bread or in other bread. So I don't quite see the analogy, do you?

Dr. HOSKINS. I wasn't trying to say there was anything wrong in his bread. There is an analogy in my opinion between the introduction of a chemical used in agriculture on a graded basis from a minute use to a large use which does correspond to the tests that were conducted with the enriched bread in just certain institutions in New York State, and to the experiments that were made with the introduction of fluorine. It was all done on a limited population.

Mr. KLEINFELD. Dr. Hoskins, I can assure you that nothing in Dr. McCay's bread was viewed with any concern; there was no untested chemical.

Dr. HOSKINS. I know that.

Mr. KLEINFELD. Well, in that case, what has that to do with using untested insecticides?

Dr. HOSKINS. It is an analogy in procedure, not the materials, that I was mentioning.

Mr. KLEINFELD. Your procedure involved using untested materials on human beings—materials untested as far as their toxicity is concerned. In Dr. McCay's case, with his bread, he wants to use substances whose toxicity is known—that they are not toxic. The only question is whether or not the bread is better or worse. That has nothing to do with toxicity. In which case I don't see how it is analogous at all to the use of untested insecticides.

Dr. HOSKINS. The introduction of any matter offers a new situation. Some people may react powerfully to it, may break out in hives. You can't claim a complete new bill of health for any composition of matter until tried.

Mr. KLEINFELD. That is what this committee is investigating.

Dr. HOSKINS. Yes.

Mr. KLEINFELD. And the committee is trying to find out whether, before you use materials on human guinea pigs, the manufacturer ought to be required to show that these materials are safe.

Dr. HOSKINS. Exactly.

Mr. KLEINFELD. You don't agree with that, do you?

Dr. HOSKINS. I do entirely.

Mr. KLEINFELD. How would you require a manufacturer to show that the chemical is safe?

Dr. HOSKINS. Exactly the way it is being done now. The various companies that introduce a new agricultural chemical put on an immense testing program. I happen to know something about these things. They are gigantic in the number of tests that are made, the number of people that conduct the tests, in order to make sure there isn't a personal factor. The time these tests are run, the whole thing, is immensely time-consuming and immensely expensive. They are actually doing this.

Mr. KLEINFELD. On what?

Dr. HOSKINS. On animals.

Mr. KLEINFELD. They apparently think that kind of work is very valuable.

Dr. HOSKINS. They do. Everyone agrees that is the very first thing that should be done with any new material that is going to be brought into contact with humanity.

Mr. MCDONOUGH. You mean that the manufacturer goes into this extensive testing before he incorporates it in the insecticide or fertilizer, whatever it may be?

Dr. HOSKINS. Yes.

Mr. DCDONOUGH. Is that a requirement in the State of California?

Dr. HOSKINS. No, it is not a requirement.

Mr. MCDONOUGH. It is a cooperative effort?

Dr. HOSKINS. It is the practice which has proven to be the best thing to do.

Mr. MCDONOUGH. Now what about a distributor that distributes material that is not manufactured in the State of California? What do you do about that—if he distributes a material that is deleterious?

Dr. HOSKINS. Well, you are getting into the legal side of this matter. That I don't feel competent to speak about. But we have strict regulation about the use of the chemical in agriculture. Mr. Lemmon, in his testimony this afternoon, I am sure will give you the details on how that is done.

Mr. MCDONOUGH. I agree. I know about that, Doctor. I am also curious to know, outside of the manufacturer, what you do about the distributor. He could be just as detrimental to the public health as the manufacturer that would not test his new material.

Dr. HOSKINS. Our laws apply to sale for use. They don't apply directly to manufacturers.

Mr. MCDONOUGH. I see.

Dr. HOSKINS. So everybody is caught in the same net.

Mr. KLEINFELD. Dr. Hoskins, on page 5 of your statement you say:

> A requirement of exhaustive animal testing before any practical use is permitted would force toxicologists to rely entirely upon results with animals in deciding whether a chemical should be given a clean bill of safety. It is surely easy to believe that under the circumstances, the official who was responsible for issuing a certificate of safety would hesitate a very long time lest humans react differently from his experimental animals.

Don't you agree that when we are dealing with toxic substances, health officials, public officials, and even people in the chemical industry and in the universities, should take a conservative approach?

Dr. HOSKINS. That is correct.

Mr. KLEINFELD. And if there is any doubt, the substance should not be used; is that not correct?

Dr. HOSKINS. There is no simple answer to that question, because when is doubt removed?

Mr. KLEINFELD. Well, give me a complicated answer. When do you think it ought to be used?

Dr. HOSKINS. Well, let's take the example of DDT.

Mr. KLEINFELD. Let's take that.

Dr. HOSKINS. We are not certain but what that material will exert a deleterious effect upon some humans after 25 years' exposure. In your opinion, therefore, we should not allow it to be used.

Mr. KLEINFELD. What is your opinion?

Dr. HOSKINS. I say that would be a foolish opinion to hold.

Mr. KLEINFELD. I see.

Dr. HOSKINS. There is a certain element of risk in everything on this earth, and it depends on whether you get more good out of the situation than you do evil.

Mr. KLEINFELD. Do you know on about how many products DDT is used today?

Dr. HOSKINS. You mean crops?

Mr. KLEINFELD. Crops, fruits, vegetables.

Dr. HOSKINS. The use of DDT has been shrinking. I would only give an estimate, but probably it doesn't get upon more than a score of agricultural products.

Mr. KLEINFELD. Do you know that we have had testimony that considerable amounts of DDT have been observed in milk and in the fatty parts of meat animals?

Dr. HOSKINS. Yes.

Mr. KLEINFELD. And there has been testimony to this committee that at least in experimental animals, certain amounts of DDT have produced growths in the liver, for example. Would you be concerned with such a state of facts?

Dr. HOSKINS. As I remember the testimony, it was to the effect that there were alterations in certain liver cells, which promptly disappeared when the animal is taken off the exposure to DDT. It was, therefore, not the type of thing that would persist; not desirable, of course, but not necessarily alarming.

Dr. HEDRICK. Mr. Kleinfeld, how many more questions do you have?

Mr. KLEINFELD. About three or four more questions.

Only within the last week or so we had before us a publication issued by the United States Public Health Service which stated that even now we don't know what the toxicity of DDT is as far as humans is concerned. That is, its chronic toxicity. You still feel that although we don't know much about the chronic toxicity of DDT we should continue using it on 20 or more different crops; is that right?

Dr. HOSKINS. Yes. I feel the risk is not great enough to overbalance the good.

Mr. KLEINFELD. And you hold to the same opinion, notwithstanding it has been shown and demonstrated that DDT is being stored in the fat of human beings, and that nobody appears to be able to state what the effects of DDT on the human being are from a chronic viewpoint?

Dr. HOSKINS. Yes; that is true.

Mr. KLEINFELD. You said earlier that the only way we could find out if DDT is stored in fat and appeared in milk is by using it; is that correct?

Dr. HOSKINS. That is right.

Mr. KLEINFELD. And that if we waited, perhaps someone might try it to see; is that right?

Dr. HOSKINS. Yes.

Mr. KLEINFELD. Isn't it a fact that experiments indicating that fact were conducted as far back as in 1945, and that these facts were published in the scientific literature?

Dr. HOSKINS. You mean the first results that DDT was found in the fat of rats, I believe?

Mr. KLEINFELD. Well, in the August 17, 1945, issue of Science there is an article which reports as follows:

DDT in quantities of significance in its toxicological evaluation is stored in the body fat of dogs given daily oral doses. The storage increases with dosage level. Feeding oil solutions of DDT gives greater accumulation in the fat than feeding the undissolved material. The accumulated DDT gradually disappears from the fat after discontinuation of administration.

The milk of lactating dogs receiving DDT or its ortho-para isomer contains appreciable levels of the respective compounds.

Now that was in 1945. Do you think on the basis of that, DDT should have been recommended in dairy barns and on dairy cows?

Dr. HOSKINS. Well, there was nothing there to indicate that the dog was injured.

Mr. KLEINFELD. There was an indication that it was stored in the fat; was there not?

Dr. HOSKINS. Yes, but many chemicals can be stored in the fat or some other part of the body.

Mr. KLEINFELD. Don't you think a careful scientist, someone concerned with the public health, should be quite conservative in recommending it for use on cows or in dairy barns, before finding out whether the storage would or would not hurt anybody?

Dr. HOSKINS. Since there wasn't any actual proof, proven case of injury, I think that was entirely a reasonably attitude.

Mr. KLEINFELD. Well, you think that an insecticide should be permitted use unless someone proves that it will hurt somebody?

Dr. HOSKINS. I don't like to answer "Yes" or "No" to that. It is again a conditional matter. If there is only supposition that something may happen, I would be in favor of taking the chance. If there is any conclusive proof, that becomes a different matter.

Mr. KLEINFELD. You would take the chance?

Dr. HOSKINS. As soon as DDT was shown to actually appear in the milk of cows, its use in dairies was promptly stopped, and that is a good example of how the present arrangement really functions.

Mr. KLEINFELD. Well, I am glad you said that, because as far back as the December 21, 1945, issue of Science, the following observation was made, and I quote:

These preliminary observations prove that with continued oral administration of DDT to goats and rats, there is eliminated in their milk a toxic substance which produces symptoms indistinguishable from DDT intoxication. The data strongly suggests the need for more intensive research on the toxicity of milk from dairy cows ingesting DDT residues either from sprayed or dusted forage plants or from licking themselves after being sprayed or dusted with this insecticide.

So apparently some scientists, at least as far back as 1945, were concerned with the possible toxicity of DDT, particularly on dairy cows; is that correct?

Dr. HOSKINS. That is right. They raised the question, and we, as well as experimenters in many other laboratories, promptly went to work on that, and it wasn't long before a very large amount of information was accumulated.

Mr. KLEINFELD. Meanwhile you were using DDT; isn't that right?

Dr. HOSKINS. It was being used to a certain extent. I think it is wrong to give the impression that the whole country was soaked in DDT. It never was. The use of DDT, as a matter of fact, has been going up all the time. More is used now than there was before this discovery about the theory, because other uses have been found.

Mr. KLEINFELD. Even though, as indicated by the Public Health Service, we can't state what the chronic toxicity is.

I have no further questions.

Mr. JONES. There is one question I would like to put in there.

Your statement that you would continue to use DDT even though there was a supposedly harmful effect would be based upon the fact that greater good was being accomplished through other uses? You wouldn't recommend the use of something that was supposedly harmful unless there was something on the other hand to overbalance that supposition; is that correct?

Dr. HOSKINS. That is absolutely correct. I am a chemist, but I have always taken the position we should turn to chemicals only when other methods do not work, and always the least harmful.

Mr. JONES. Is it not a fact also that we will always find, let's say isolated chemists who will recommend against many substances which the majority would not find fault with?

Dr. HOSKINS. That is true.

Mr. JONES. That is all.

Mr. HORAN. As it was used in the operative industry, do you feel that DDT was harmful either to the applicator or in the residue formed on the product, that it was any menace to public health?

Dr. HOSKINS. No, I don't believe that any great harm has been done, any appreciable harm.

Mr. HORAN. As it is used by responsible industries concerned?

Dr. HOSKINS. I am glad you put the question that way, because it seems to me an awful lot of time has been spent about the use of materials in a way they are never actually used, and their effect at levels never actually occurring.

For example, the Food and Drug Administration wasted about 2 years in conducting chronic feeding tests of DDT at levels of 100 or 200 parts per million, and it never occurs as a result of actual practice that more than 5 to 7 parts per million——

Mr. KLEINFELD. You are not a pharmacologist, are you?

Dr. HOSKINS. Not by training, but I can read.

Mr. KLEINFELD. I am sure you can. But all the pharmacologists, those qualified to discuss the effects of poisons in humans, including those in the Food and Drug Administration and Public Health Service, apparently feel that administering large doses to animals gives them valuable data. There you disagree too?

Dr. HOSKINS. I don't disagree, but similarly large doses of table salt can be taken and show deadly results.

Mr. KLEINFELD. You agree——

Dr. HOSKINS. It is all right to subject an animal to very severe treatment, because all harmful results show in a hurry.

Mr. KLEINFELD. Don't we want to do that?

Dr. HOSKINS. It should not be carried over to practical use. Where so many people fall down is they can't distinguish between a theoretical arrangement and a practical situation.

Mr. KLEINFELD. The practical situation being that we want to kill insects?

Dr. HOSKINS. And that we do not leave residues that are anywhere near these levels that incite so much alarm.

Mr. KLEINFELD. How do you know if they do harm if you haven't done long-range tests?

Dr. HOSKINS. We are back where we started.

Mr. KLEINFELD. According to you, we watch the human beings that are ingesting it; is that right?

Dr. HOSKINS. That is right.

Mr. KLEINFELD. No more questions.

Dr. HEDRICK. We are very grateful to you for the statement. It is most interesting and I know will be a lot of help to our committee.

The committee will recess until 2:20.

(Whereupon, at 1:20 p. m., the committee recessed until 2:20 p. m., of the same day.)

AFTERNOON SESSION

Dr. HEDRICK. The committee will come to order. Who is the next witness?

(The oath was administered by the chairman.)

TESTIMONY OF ALLEN B. LEMMON, CHIEF, BUREAU OF CHEMISTRY, STATE DEPARTMENT OF AGRICULTURE, SACRAMENTO, CALIF.

Mr. KLEINFELD. What is your full name, Dr. Lemmon?

Dr. LEMMON. I am Allen B. Lemmon, chief, bureau of chemistry, State Department of Agriculture, California.

Mr. KLEINFELD. What is your academic background?

Dr. LEMMON. I am a graduate of Stanford University in engineering, receiving my A. B. in 1930 and my degree of engineering in 1932 after 2 years of graduate study.

Mr. KLEINFELD. And you are now chief of the bureau of chemistry of the State of California Department of Agriculture?

Dr. LEMMON. That is right.

Mr. KLEINFELD. Generally speaking, what are your duties?

Dr. LEMMON. The bureau of chemistry administers the laws of California concerning the sale of fertilizing materials, economic poisons or pest control materials, licensing of agricultural pest-control operators, and limiting the amounts of spray residue permissible on fruits and vegetables.

Mr. KLEINFELD. How long have you been associated with the bureau of chemistry?

Dr. LEMMON. I have been with the bureau of chemistry since July 1933.

Mr. KLEINFELD. Will you please read your statement, Dr. Lemmon?

Dr. LEMMON. At your hearings in 1950 I submitted a prepared statement which was introduced on December 1, 1950, and appears on page 459 of the 1950 hearings. This statement covered the work of the bureau of chemistry of the State department of agriculture with regard to administration of the laws governing the sale of fertilizing materials and economic poisons, as well as enforcement of the spray-residue article of the agricultural code. It is believed that the committee will be interested in more detailed information concerning our procedure in registering economic poisons and also the latest information in enforcement of the spray-residue law.

Section 1071 of the agricultural code of California requires each economic poison, which is the legal term to cover all materials used

for pest control, to be registered before being offered for sale in the State. Section 1072 provides that the director, after hearing, may cancel the registration of or refuse to register any economic poison which is of little or no value for the purpose for which it is intended or which is detrimental to vegetation, except weeds, to domestic animals or to the public health and safety when properly used and may require such practical demonstration as may be necessary to determine said facts.

In order to be helpful to firms making application for registration of economic poisons, we have prepared a list of items that are considered with regard to a product when an application for registration is received. They are—

Chemical and physical:

(1) Chemical name.
(2) Chemical formula.
(3) Chemical structure.
(4) Melting point.
(5) Boiling point.
(6) Vapor pressures at various temperatures.
(7) Solubilities in various solvents.
(8) Odor.
(9) Density. This is important for some liquid products to compare dosages by volume and by weight.
(10) Corrosive action on metals.
(11) Flammability.
(12) Stability: (*a*) Hydrolysis, (*b*) oxidation, (*c*) sunlight, (*d*) explosion hazard.
(13) Suitable diluents.
(14) Purities, grades, or mixtures to be available commercially.

Proposed usage:

(1) Name or names of the pest, pests, or type of pest for which the product affords control (avoid vague terms such as mildew, blight, worms, mites).
(2) Name or names of the plants, crops, animals, or places to which product is to be applied (avoid vague terms such as trees, vegetables, flowers, livestock).
(3) Dilution recommended. (For example, "Use without dilution." "Use 1 gallon with 99 gallons water to make 100 gallons spray.")
(4) Preparation for use. (For example, "Fill the tank one-quarter full of water. Start agitator running. Slowly add the emulsion and then fill the tank." "Maintain agitation while using.")
(5) Method of application. (For example, "Apply as a spray, using particular care to wet thoroughly the lower side of the leaves." "Dust plants thoroughly to contact as many of the insects as possible.")
(6) Rate of application. (For example, "Apply 15 gallons per tree." "Use 5 pounds per thousand square feet of lawn." "Apply 25 pounds per acre." "Apply 200 pounds per acre and disk into the soil.")
(7) Time of application. (For example, "Apply when buds begin to swell in spring." "Apply when jackets are falling from

the fruits." "Apply when insects first appear." "Apply before plants start to head." "Do not apply during blooming period.")

(8) Frequency of application. (For example, "Dust plants thoroughly at 3-week intervals during growing season." "Do not spray oftener than twice a year.")

Effectiveness: What data are available to demonstrate the effectiveness and suitability of the product for the intended usage? If it is for control of pests on plants, the data should apply to the specific pests on the specific host plants to which the product is to be applied.

Hazards and cautions:

(1) What are the primary hazards to human beings who handle the compound, the particular parts of the body affected, the symptoms of poisoning, and their duration?

(2) What is the acute toxicity to the particular species of animals on which it has been determined by: (*a*) Inhalation, (*b*) ingestion, (*c*) skin absorption.

(3) What is the chronic toxicity to the particular species of animals on which it has been determined by (*a*) inhalation, (*b*) ingestion, (*c*) skin absorption?

(4) What symptoms are shown by poisoned animals?

(5) What information is available on first aid or medical treatment of affected persons or animals?

(6) If it is to be applied to food crops—(*a*) What data are available with regard to surface residues resulting from the recommended usage? (*b*) What data are available with regard to absorption into the treated foodstuff? (*c*) What data are available with regard to the possible effect it might have on the taste or quality of the treated foodstuff? These questions apply to the fresh fruit or vegetable, processed commodities, and to byproduct uses of the commodity.

(7) What is known about its toxicity or harmfulness to valuable plants or animals on which it might be used? (*a*) Are certain plants sensitive? (For example, cantaloups and apricots are sensitive to dusting sulfur. White clover in lawns may be injured by 2,4–D used to control dandelions. Beans may be injured by arsenicals.) (*b*) Are certain animals sensitive? (For example, cats may be injured by coal-tar dips or some of the chlorinated hydrocarbons. Calves may be injured by oil sprays. Caged birds may be injured by dusts.) (*c*) Is it injurious to plants under certain conditions? (For example, petroleum oil sprays may injure plants if applied when plants are abnormally dry or when temperatures are above 90° F. Coal-tar products may be suitable for application to dormant deciduous trees but they are injurious to foliage.)

(8) Are there any other hazards? (*a*) Does it leave a stain or unsightly residue where these might be objectionable? (For example, aerosols may stain walls or furnishings if the applicator is held too close to the surface. Bordeaux mixture, lime sulfur, and some other products may leave objectionable residues on ornamental plants, flowers, or fruits. Oil sprays may blemish table grapes or plums.) (*b*) Does it impart an obnoxious taste to prepared foods as benzene hexachloride insecticides or coal-tar disinfectants do? (*c*) Does it injure asphalt tile floors as kerosene-base household sprays do? (*d*) Does it present a hazard to

honeybees? (*e*) Is it particularly injurious to cats, fish, or caged birds? (*f*) Does it persist in the soil and injure crops subsequently planted, as 2,4–D and DDT do under some conditions? (*g*) Is it absorbed by dairy cattle and excreted in the milk? (*h*) Does it corrode or otherwise injure spray or dust equipment? (*i*) Are precautions necessary in storing the product to avoid contamination of other materials? (*j*) Are precautions necessary in disposal of empty containers to avoid possible injury? (*k*) Are any special precautions necessary in cleaning, spraying, or dusting equipment?

Analytical methods:

(1) What analytical methods are available for: (*a*) The technical material? (*b*) Commercial products containing it with other ingredients? (*c*) Spray and dust residues or other minute amounts on foodstuffs or other contaminated material?

(2) If analytical methods are not available, how is the quality of the manufactured product controlled?

(3) Is some of the purified chemical available for use in development of analytical methods?

Miscellaneous information:

(1) If it is to be applied to foodstuffs, how may residues be removed?

(2) What data are available concerning compatibility, either chemical or biological, with other pesticides or other agricultural chemicals?

(3) Does it influence the growth, structure or physiology of plants?

(4) What effect does it have on beneficial insects?

(5) Has the product been registered with the United States Department of Agriculture, Production and Marketing Administration?

Mr. McDONOUGH. These are all precautions to determine the toxicity of the material and its effect on the individual applying it?

Dr. LEMMON. These are items that we consider whenever a new economic poison is offered for registration. We go down the list of check items that we have here to determine, first, whether or not it is suitable for the purpose claimed on the label.

Mr. McDONOUGH. That it is suitable for the killing of bugs?

Dr. LEMMON. Suitable for the killing of bugs.

Mr. McDONOUGH. All right.

Dr. LEMMON. Then, second, whether or not there are any hazards to the operator applying it and what precautions are necessary to prevent injury. Then the question of accidental swallowing is also considered with final consideration given to spray residue that might remain.

There are many products that are not used on food crops so spray residue does not need to be considered. But if it is to be used on a food crop and leaves a residue, that information concerning that residue must be considered before direction for use is accepted covering such usage.

In 1950 there was submitted for the record a copy of Bureau of Chemistry Announcement No. EP–62, which incorporated a similar list. It was published in Special Publication No. 240, which presents the list on pages 11 to 14. I have extra copies of that publication,

and probably members of the committee would like to have them. The publication provides in addition to the list of items we consider, a list of names and nicknames of pesticidal materials on pages 10 to 20. I have considerable difficulty remembering what chemical is meant when somebody uses a nickname or a number, to refer to a chemical. I asked the list be prepared so I would be able to tie in the different initials with the different chemicals, and then it was of so much use that we have published it in this publication, which includes, among other things, the analysis of all the different economic poison samples that we drew during the year 1950–51 in enforcement of our economic poisons law. Copies of that publication will be available upon request.

Dr. HEDRICK. In other words, we can get as many as we want?

Dr. LEMMON. Within reason.

Dr. HEDRICK. Then we will not go to the expense of putting it into the record.

Dr. LEMMON. It is not necessary, because we will be glad to provide copies.

Dr. HEDRICK. All right.

Dr. LEMMON. Continuing with my prepared statement:

If the information is not already available to the Bureau, the manufacturer is requested to submit the data pertinent to his particular product. If a manufacturer submits for registration a standard product properly labeled for a standard usage, registration can be issued forthwith. If he submits a new chemical or a product for a new usage, a number of questions must be answered. Some of these can often be secured from the files of technical information maintained by the Bureau, but information on the others must be submitted by the applicant. Naturally the amount of information needed depends upon the proposed usage. For example, we must know more about materials to be used on food crops than we need to know about a weed killer used to treat the soil in airfields. We must know more about a product for application to livestock than we need to know about a preservative for fence posts. Adequate information on potential hazards of materials intended for use on food crops may require detailed and prolonged investigations, particularly with regard to chronic toxicity, and generally a manufacturer who intends to market such a product must conduct his laboratory and field investigations over 1 or 2 years to secure the information necessary to outline the potential use and hazards involved.

Adequate labeling of an agricultural chemical depends upon the particular material and the particular usage involved. Labeling of some materials is necessarily quite specific and detailed; labeling of others may be rather brief and general. As examples of the labeling of the 9,000 agricultural chemical products marketed in California, there are submitted 10 labels taken at random from those in current use. The firm names of the registered manufacturers and any brand names have been removed from the labels in order not to lend undue prominence to any manufacturer. These labels show typical directions for use and precautionary labeling required on economic poisons.

I might add that most of these products are shipped in interstate commerce and, therefore, I presume they are also registered federally.

Label No. 1: Powdered standard lead arsenate. This is one of the old reliable, highly toxic economic poisons that has been used in large

quantities throughout the United States for many years. The label carries directions for use against the pests enumerated and quite prominently shows the skull and crossbones, the word "Poison," and the precautions to be taken. These include the statement:

Do not apply to edible portions of plants unless the remaining injurious residues will be removed before eating.

Label No. 2: Arsenate-copper-sulfur dust. This is a combination material used both as an insecticide and as a fungicide. This material is highly toxic as it contains tricalcium arsenate and the label carries the skull and crossbones, the word "Poison," with several notes of warning. One note reads:

The product is recommended for the control of tomato russet mite on market tomatoes, but it is not recommended for use on cannery tomatoes when the cannery has a restriction covering the percentage of sulfur to be used in a dust.

There is the caution:

The sulfur contained in this mixture may injure certain cucurbits, namely, melons, cucumbers, and squash, and should only be used where sulfur has proved safe and effective.

There is the usual spray residue warning required on arsenicals which states:

Whenever this material is used on a food crop, particular attention should be given to the removal of the arsenical residue at harvesttime.

Mr. McDONOUGH. Does that apply to food crops for animals as well as for humans?

Dr. LEMMON. Directions would apply to any feed crop.

Mr. McDONOUGH. I see.

Dr. LEMMON. I might add, as far as our spray residue law in this State is concerned, the jurisdiction of our bureau of chemistry goes only to fresh fruits and vegetables and would not cover feeds.

Label No. 3: Cryolite dust 50 contains sodium fluoaluminate, which is a fluorine-containing chemical and may leave fluorine spray residue if applied to edible crops. The label carries, in addition to the directions for use, the warning:

Whenever this material is used on a food crop, particular attention should be given to the removal of the fluorine at harvesttime.

There is the caution.

Do not combine with lime in any form. Apply only when the foliage is dry. Apply to leafy vegetables, such as cabbage only when the plants are small. The outer leaves bearing the poison can then be stripped off before the food comes to the table.

Label No. 4: Insecticide dust RS 15. This is a product containing rotenone and sulfur. This material does not leave toxic spray residues and no special precautionary labeling is required.

These four labels illustrate products that have been in use for many years and concerning which the literature provides full information. If the manufacturer sets his claims in accordance with common knowledge, there is no difficulty in registering the products. I might add that without doubt there may be individuals that would argue as far as toxicity is concerned on even these materials that have been in usage for many years. But with the usage we have had, that is, experience, we know the type of directions that are necessary in order to use these materials without having difficulty.

Label No. 5: Insecticide-fungicide dust DF 56. This contains two of the newer economic poisons, DDT, an insecticide, and zineb, a fungicide. During the last 6 years we have received considerable data concerning these two constituents and there has probably been more experimental work done with DDT than with any other economic poison. You will note that the label does not require the skull and crossbones and the word "Poison" but does show a list of cautions. These include the statement:

Avoid applications that will carry residue on edible portions of crops when harvested for market. Do not use on dairy animals or dairy barns. Do not use on crops to be fed to dairy animals or to those being finished for slaughter. Do not use on food crops unless excessive residue can be removed before market. Do not apply to food crops within 30 days of harvest.

Label No. 6: Another new one—BHC emulsifiable 10 percent, contains as active ingredients the gamma isomer of benzene hexachloride and also other isomers of benzene hexachloride. This is one of the newer materials that may cause off-flavor when applied to food crops. In addition to the poison label, there is a caution statement which reads as follows:

Do not spray into or near fire or open flame. Do not smoke while spraying. Keep container closed. Do not leave in eyes or on skin. Avoid prolonged breathing of vapor or spray mist. Wash thoroughly with soap and water after exposure. Avoid contamination of feed and foodstuffs. Do not store near feed, seeds, fertilizers or other products which may absorb odors.

The label carries several directions to use care in handling the product. It states:

Warning—Do not use this product on dairy animals, in dairy barns, or feed or forage to be fed to dairy animals or to animals being finished for slaughter.

There is also the statement:

Important: Do not apply to livestock within 90 days of slaughtering and do not use on milking dairy cattle as off-flavoring and odor in meat and milk may result.

These directions are intended to prevent misuse of the material with resultant contamination of meat or milk. In connection with the directions for wireworm control, there appears the statement:

Since certain crops have a tendency of taking up the odor of this chemical, an interval of from 3 to 4 weeks or longer should be allowed between treatment of the soil and planting.

Label No. 7: Chlordane 40–W dust. The label for this product shows technical chlordane 40 percent as the active ingredient and carries directions for use against a great many pests. The product is not sufficiently toxic to require the skull and crossbones and the word "Poison" in California, although caution statement is required and reads as follows:

Avoid inhaling dust and mist from spray. Use respirator. Chlordane is toxic and when in solution can be absorbed through the skin. Wash with soap and water after exposure. Whenever this material is used on a food crop, particular attention should be given to the removal of the residue at harvest time. Avoid contaminating feed and foodstuffs. Do not use this product on dairy animals, in dairy barns, or on feed or forage to be fed to dairy animals or to animals being finished for slaughter.

In addition to the general cautions, the label carries specific warning:

Caution: Make no application to food crops within 30 days of harvest or as otherwise noted above.

This refers to another special caution which states:

Do not apply to string beans after the pods begin to form and to celery after it begins to bunch.

These warnings are to make certain that no chlordane remains as spray residue on edible portions of crops.

Label No. 8: Aldrin 25 percent emulsifiable. This is one of the newer chlorinated hydrocarbon chemicals being developed for pest control. This material has quite limited usage at present and is accepted for control of certain insects on cotton as enumerated on the label. It is also used for control of grasshoppers, where application will not be made to feed or forage crops in such a manner as to leave any residue. It is not intended for use on any food crop until further information is developed with regard to chronic toxicity and any special hazards of food contamination. In addition to the poison label, the label carries a series of warnings, as follows:

Fire hazard: Do not spray into or near fire or open flame. Do not smoke while spraying. Hazardous if swallowed, inhaled, or absorbed through skin. Avoid inhalation and skin contact. Wear protective clothing, gloves, and goggles. Wear an effective chemical cartridge type organic vapor respirator. Use clean clothing daily. Wash thoroughly with soap and warm water after exposure. Do not apply nor allow to drift where there may be grazing by dairy animals or animals being finished for slaughter. Do not apply this product within 15 days of cotton picking. Do not contaminate food with this product. Keep away from children and domestic animals.

Label No. 9: TEPP 1 percent dust. This product is a highly toxic material requiring utmost caution by persons using it for pest control, but does not offer a spray residue hazard as it deteriorates or weathers rapidly and does not leave spray residues. In addition to the poison insignia the label carries the following warning:

Danger: This is a strong poison and rapidly absorbed through the skin. Avoid prolonged skin contact. Operators should be provided with dust respirators or take other means to avoid inhaling this dust. Operators should remove gloves or other protective garments and wash with soap and water before eating and after work. Persons susceptible to this product should be removed from job at the first sign of overexposure indicated by nausea, tightness in chest, or painful vision. Keep all persons out of the operating areas or vicinity where there may be danger of drift. Vacated areas should not be reentered until the drifting insecticide and volatile residues have dissipated, which requires approximately 4 hours.

Label No. 10: Parathion W–25. This label illustrates the extremes to which manufacturers have gone in order to educate people with regard to the dangers concerning the use of this material and what precautions must be used. In addition to the poison insignia and precautions that must be taken by the operator handling this product, which are described on the left panel of the label, special precautions are given concerning residues. These are as follows:

Do not apply parathion formulations to any deciduous fruit crops within 20 days of harvest; to lima beans, dry beans, beets, carrots, melons and squash, peppers, and peas within 15 days of harvest; to snap beans, cabbage, broccoli, brussels sprouts, kale, mustard, turnips and related crops, celery, spinach, cucumbers, onions, potatoes and tomatoes and artichokes within 21 days of harvest. Warning: Keep all persons out of operating area or vicinity where there may be danger of drift. Vacated areas should not be reentered until the drifting insecticides or volatile residues have dissipated.

It should be noted that parathion products are not sold for use by home gardeners in California on account of possible hazard in such use.

These labels illustrate the importance that we place upon warning growers of possible spray residue hazards. Our work in enforcement of the spray residue law of California confirms the value of an educational program with regard to use of pest-control materials in such a manner as not to leave hazardous spray residues.

There has been decided improvement in this regard in the produce we have found offered for sale in the California markets. The newer materials, although highly toxic, in general do not leave the persistent residues that remained from use of the old metallic poisons.

In the Los Angeles markets in 1938 our annual report showed of 3,779 samples of various suspicious fruits and vegetables, 16 percent were over tolerance. Produce represented by these samples was quarantined out of sale until properly reconditioned either by washing, or trimming in the case of vegetables such as cabbage. Many warning letters were sent out and several score hearings were held for farmers with spray residue violations. About a dozen criminal complaints were filed against persons selling produce in violation of the law. In our annual report for 1940, 2 years later, in connection with spray residue enforcement, we stated that approximately 7,000 analyses were made of fruits and vegetables to determine quantities present of lead, arsenic trioxide, and fluorine. Enough of these samples were found with excess spray residue so that approximately 150 warning letters were sent out with 50 hearings held and 10 cases prosecuted, resulting in substantial fines. This may be compared with the report for 1950, when 2,842 samples of fruits and vegetables were analyzed for spray residue. These were drawn from packing centers and wholesale markets throughout the State and, although the samples were picked from those lots believed by the inspectors to be most likely to carry spray residue, only 103 samples contained over-tolerance amounts of spray residue. Unlike violations in previous years, the overages were small and the circumstances involved in the cases did not warrant filing any criminal complaints. In other words, there has been a steady improvement during the last 15 years in the use of pest control materials in California without high spray residues remaining on produce being offered for sale.

In addition to the new materials and the educational program that has been carried on by those interested in proper pest control, mention should be made of the new Pest Control Operator Licensing Act which is jointly enforced by the State department of agriculture and the agricultural commissioners in each county. I believe other witnesses, particularly Mr. Harold J. Ryan, agricultural commissioner of the county of Los Angeles, will provide full details with regard to the enforcement of this law, which we regard of great importance in assuring proper application of pest-control materials.

We have worked cooperatively with the Insecticide Division of the Production and Marketing Administration of the United States Department of Agriculture in connection with registration of economic poisons and have found that agency of great help to us in reviewing claims on labels of economic poisons before they are registered. We also have worked cooperatively with the United States Food and Drug Administration in the enforcement of the spray residue law and have found that agency particularly helpful in providing information with regard to toxicity of economic poisons and also helpful in case of interstate shipments of produce carrying excess spray residue. It is

our opinion that present Federal laws provide as complete protection as can be reasonably expected insofar as Federal law is concerned. I speak now of pest-control materials and spray residue. The States and counties must carry on adequate policing under local laws to prevent misuse of economic poisons with resultant residues in food crops.

There is one problem that we do believe needs attention and that is, a better way of establishing tolerances for spray residues on fruits and vegetables. The present Federal legal system seems too cumbersome and expensive. I am not criticizing the United States Food and Drug Administration, as I believe it has done the best it could, but we still do not have Federal tolerances for spray residues, although the Federal Food, Drug, and Cosmetic Act of 1938 provided that tolerances shall be promulgated and extensive hearings were finally held throughout 1950. To my mind, there is a difference between the deliberate addition of chemicals to foods and residues that may accidentally be present as a result of application of pest-control materials. The materials that are directly added intentionally can be controlled as to the amount and are present whenever the additions are made. On the other hand, spray residues are not intentionally added but are the result of necessary measures to control pests. The amounts vary from lot to lot and depend upon many factors including amounts necessary to control the pests, weathering, and handling of the food crop before being offered for sale. It should be realized that most produce does not carry an appreciable amount of spray residue.

Among suggestions that have been offered to the committee, I believe that probably the most workable is to have the United States Department of Agriculture continue to determine suitability of use of economic poisons as it now does through registration. If a product is too hazardous to use, registration can be refused by it. The Federal Security Agency should determine a tolerance based on toxicity of the economic poison and registration by the Department of Agriculture should be sufficient to satisfy "necessity of use." It would not be proper to withhold an economic poison from the market because through some misuse it might leave a spray residue, but there should be definite tolerances set in order that prompt action may be taken against those who do not handle the materials properly in order to prevent residues being present. We believe that definite and reasonable tolerances are helpful to farmers in enabling them to know what standards must be met and they are a definite help to the enforcement official as a guide with regard to seizure of unlawful produce and prosecution of the law violator.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. One thing. I was wondering, how do you determine whether or not this label shall include this poison insignia?

Dr. LEMMON. In California there is a poison law administered by the State board of pharmacy which is separate from our economic poisons article, and in that law there are requirements with regard to poison insignia and label and first-aid treatment. We work cooperatively in the enforcement of the poison law insofar as economic poisons are concerned and apply the requirements there to our economic poisons.

Mr. JONES. In other words, the absence of the poison insignia does not mean that the material is nonpoisonous?

Dr. LEMMON. No. As far as that goes, very few, if any, economic poisons are, we would say, absolutely nonpoisonous. Most of them are toxic.

Mr. JONES. I see some of the labels do carry it and some do not carry it, and to me it seemed one would be about as poisonous as another.

Dr. LEMMON. In general a poison label is required for any material that would be seriously injurious if taken by mouth. The skull and crossbones is there to warn people not to put the material in the mouth. There are other hazards, such as skin absorption. If they are very high, the material should also have the skull and crossbones to complete the poison label. But generally the procedure is to provide precautions against the specific hazards on the label rather than just to put a poison label on everything.

Mr. JONES. I have no further questions.

Dr. HEDRICK. Mr. Horan?

Mr. HORAN. No questions.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. I think it is a very comprehensive statement and very educational. I have no questions.

Dr. HEDRICK. Doctor, it has been said by some very influential and scientific men that the American people are gradually being poisoned to death. What do you think of that statement?

Dr. LEMMON. I do not believe it is true. But I recognize the authority in some of those individuals, and I believe that they are perhaps misled by taking one circumstance or incident and applying it to all.

I know insofar as our fruits and vegetables are concerned, the reports are unfounded. I was very much interested in your question this morning, Mr. Horan, about the warning that the movie actress had given out. We in California, perhaps haven't paid as much attention to that statement as was paid to it on the east coast. Generally, though, if a statement such as that comes to our attention, we write the individual from our office, sending a copy of our annual report and pointing out what the law requires and what actions are taken to prevent spray residues appearing on our produce in this State.

Mr. HORAN. Do you know of any case where a person could be certified to have died from eating sprays from fruits or vegetables?

Dr. LEMMON. No, I do not know of any such case. On the other hand, I have seen produce where arsenicals were used—now speaking, for example, of a leafy vegetable, cabbage, where it had so much calcium arsenate on it, it was just white. I would not want to eat it. Anybody seeing it would peel it off. That produce was seized on the market in California and the grower was prosecuted.

Dr. HEDRICK. It is almost impossible to prevent getting some poison into your system as many sprays are used on our foods. The hotels spray the beds with DDT, and all the rest. You are bound to absorb some. Is that not true?

Dr. LEMMON. I think that is likely, the same as when we smoke we inhale a little bit of nicotine and other things involved there. And when we ride in streets, the exhaust of automobiles we inhale is not good for us. It is part of our way of life. I believe the hazards from use of pest control materials is no greater, and probably less, and I know we have better control in this State than many others.

Dr. HEDRICK. We had a man before our committee that testified, in his opinion, virus pneumonia was caused by DDT. Have you heard anything about that?

Dr. LEMMON. I have seen that charge made. I am not an expert in that field, but I would certainly express the opinion that I don't believe it is true from other information I have seen to the contrary.

Dr. HEDRICK. Do you have any further questions, Mr. McDonough?

Mr. MCDONOUGH. No.

Dr. HEDRICK. Dr. Lemmon, we thank you for your statement.

Mr. KLEINFELD. May I ask some questions?

Dr. HEDRICK. Mr. Kleinfeld.

Mr. KLEINFELD. Dr. Lemmon, in connection with benzene hexachloride, label 6 bears the statement:

NOTE.—Since this material may be absorbed through either foliage or roots and impart an odor and taste to vegetables, it should not be used on food crops.

Has this label always contained such a warning, as far as you know?

Dr. LEMMON. As far as I know there has been a general warning on benzene hexachloride products where there was a direction to apply them to certain food crops that care must be taken not to cause injury.

I am thinking back now to some years ago when there was difficulty with potatoes on the east coast, and at that time I recall seeing some of the directions out of the experiment station. They were not published, I believe, but they may have been later. But I think there was a direction as to the amount to be used, and then when the farmers used more than that, they had difficulty. We had the same thing in this State.

Mr. KLEINFELD. There were some crops like potatoes and peanuts——

Dr. LEMMON. That is right.

Mr. KLEINFELD. Which were ruined as far as large quantities were concerned because of the use of benzene hexachloride which caused a musty odor and off-flavor.

Dr. LEMMON. That is correct.

Mr. KLEINFELD. Do you know whether the label that was used at that time contained this warning?

Dr. LEMMON. I don't remember, but I know since we first had any of that material here in this State the general warning has been to use it with care and not to contaminate foodstuffs.

Mr. KLEINFELD. When an insecticide is referred to you, Dr. Lemmon, for registration, do you require data with respect to possible consequences as far as off-flavor is concerned?

Dr. LEMMON. We have recently—the last few years.

Mr. KLEINFELD. Why is that?

Dr. LEMMON. Because of this first difficulty with benzene hexachloride coming to our attention. Then we heard, or at least the processing industry told us, that they were having difficulty with flavors developing in the canned produce and in order to be helpful to them and to avoid any contamination we have requested information on new chemicals as to what effect they would have on canned produce. That is now progressing into a regular program for development of information before a product is accepted for label for such usage.

Going back, probably the first one that comes to mind was about 10 years ago when a new pest, tomato russet mite, came in on our toma-

toes here in California, and it was found it was necessary to use sulfur to control that pest. The canners have always been fearful of any sulfur going on produce which is to be canned, so a warning was required on the labels of those tomato dusts that they must secure approval of their canner before they were used.

Mr. KLEINFELD. Then you are requiring some information on off-flavors before you register an insecticide?

Dr. LEMMON. That is right.

Mr. KLEINFELD. Do you think that is a good thing to do?

Dr. LEMMON. Yes.

Mr. KLEINFELD. Benzene hexachloride persists in the soil for some time; does it not?

Dr. LEMMON. That is my understanding; yes.

Mr. KLEINFELD. I have not read this label too closely, but do you know whether there is a warning given telling users it may or will persist in the soil and that he must watch out with respect to future crops?

Dr. LEMMON. I don't recall offhand, but if I would look at the label——

Mr. KLEINFELD. Surely [handing document to witness.]

Dr. LEMMON. On the directions for soil treatment, which is for wire worm control, "Treatment should be limited to soils in which non-root crops are grown." That is a warning there. Over further, it says:

Important: Since certain crops have a tendency of taking up the odor of this chemical, an interval of from 3 to 4 weeks or longer should be allowed between treatment and planting.

I take that to mean those crops which are other than root crops.

Mr. KLEINFELD. The reason I ask is because there have been reports in the fairly recent past about benzene hexachloride being used on cotton, and then when peanuts were subsequently grown the peanuts had a musty off-flavor.

Dr. LEMMON. I am familiar with that report. In fact, shortly after we first received the report, we called a meeting with the chemical industry that sells economic poisons here in this State and discussed the whole situation. We came to a general agreement as the outgrowth of that meeting that the salesmen would use care in recommending benzene hexachloride products where they would leave residues that would give off-flavor.

Mr. KLEINFELD. As far as lindane is concerned, does that give an off-flavor or delayed off-flavor, do you know?

Dr. LEMMON. Lindane is the gamma isomer of benzene hexachloride. In other words, it is a purified form and it has less odor or taste or off-flavor than the technical grade material. Furthermore, a great deal less material is used than of the technical grade material because of its high purity. On that basis, on equal amounts, it would give considerably less off-flavor, if any.

Mr. KLEINFELD. Have you had reports of there being a delayed off-flavor?

Dr. LEMMON. I have seen such reports, but I have never been able to confirm them. In fact, on vegetables that we found that were off-flavor, the grower had used both lindane and benzene hexachloride, and we couldn't tie it down to which was responsible. I believe it

was the benzene hexachloride rather than the purified form, but I have no proof.

Mr. KLEINFELD. If there were a delayed off-flavor it would present a real problem to the food processor or canner; would it not?

Dr. LEMMON. That is right.

Mr. KLEINFELD. You mentioned also label 7, which is on the chlordane preparation.

Dr. LEMMON. That is right.

Mr. KLEINFELD. Apparently chlordane is used on a number of food crops; is that right?

Dr. LEMMON. Very litfle in this State. I had to look hard to find that label.

Mr. KLEINFELD. Well, it says, "For use on peas, beans, beets, spinach, onions," and so forth.

Dr. LEMMON. That is right.

Mr. KLEINFELD. The reason I am a little curious about that is that Dr. Lehman, Director of the Division of Pharmacology of the Food and Drug Administration, testified before this committee that chlordane was so toxic from a chronic viewpoint, being four or five times as chronically toxic as DDT, in his opinion it should not be used where it might possibly contaminate foods. In fact, he was doubtful whether it should be used even in households.

Now, if chlordane is sold for such wide use and on as many crops as is specified on this lable, apparently there is quite a difference of opinion between the school of thought as expressed by Dr. Lehman and the people who permit chlordane to be used in this fashion.

Dr. LEMMON. No, I don't believe so. I am in full agreement with Dr. Lehman. I rely heavily on his advice and information. I think perhaps there may be a little question of difference of interpretation. My interpretation of his statement was that there should not be any residues from chlordane on what we eat. My interpretation of those directions on that label are that if it is used according to those directions, then there will not be any residue on the produce.

Mr. KLEINFELD. It may be. We got the impression, or at least I did, that he recommended strongly against the use of chlordane on any food crops at all.

Dr. LEMMON. That means not on the edible portions.

Mr. KLEINFELD. Well, are we quite certain that the food canner can tell whether chlordane has been used on any particular crop?

Dr. LEMMON. He would ask the grower and quite often he pays for the chemicals that go on the crop.

Mr. KLEINFELD. Let's assume that a food packer wants to be punctilious in seeing to it that there is no residue—particularly, let's say, on baby food—and he wants to make the proper analysis.

Dr. LEMMON. Yes.

Mr. KLEINFELD. We have been advised there is no really practical, certain method of analyzing for chlordane.

Dr. LEMMON. I rather anticipated that question. In our spray residue analyses of produce we determine lead, arsenic, fluorine, and organic chlorine. The organic chlorine then is computed to DDT, and it is the dehydrochlorination of the DDT that we count.

I thought it would be of interest to the committee to pursue the matter to determine what would be the result if one of the other

chemicals were present other than DDT, and we determined the organic chlorine and then computed it to DDT—what would be the result if there was something else there that we didn't identify rather than DDT. That particular test would show up DDT, DDD, and, for lack of a better word I will use the term Aramite, which is a trade name, methoxychlor, chlordane, toxaphene, and benzene hexachloride. And for all of those materials, if one was calculated instead of the other, the resulting factor would come out very close to the same figure.

In other words, if the amount of chlorine present would be equivalent to DDT one part per million, then for DDD it would be 1.1; Aramite would be 1.07; methoxychlor would be 1.03; chlordane, 0.86; toxaphene, 0.85; benzene hexachloride, 3.65.

In other words, actually if we held to a seven parts per million tolerance on all of those materials, benzene hexachloride would be held much lower than that because of the higher factor for it, and that is, as a practical matter in the field laboratory, what we do. So we do get full protection from our organic chlorine analysis.

Mr. McDONOUGH. In addition to that test, the packer tests also?

Dr. LEMMON. These tests we make are of produce offered for sale on the market to see that the person selling the material is within tolerances.

Mr. McDONOUGH. That is to the small consumer, we will say?

Dr. LEMMON. On the wholesale markets in San Francisco and Los Angeles, our inspector looks over the produce in each stall.

Anything that shows a suspicious-appearing residue of any type is sampled. If he doesn't see anything, then he takes a few samples just blindly from a lot here and there, whatever number he can handle during that day. He takes them to the laboratory and analyzes to determine what, if any, residue is present.

Mr. McDONOUGH. That is for the hotel trade and retail trade?

Dr. LEMMON. Retail stores, home owners.

Mr. McDONOUGH. And the consumer. But for large crop purchasing by the canner, what would you do to check that?

Dr. LEMMON. The canner has his own laboratory generally.

Mr. McDONOUGH. Do you do anything?

Dr. LEMMON. We do not do anything as far as checking produce going to the cannery. Anything done on that line is done through the department of public health in cooperation with the Food and Drug Administration in cooperation with the canner. I am not too familiar with that because we have a dividing line here in this State. Certain work is Food and Drug and certain work is Department of Agriculture. Fresh fruits and vegetables for spray residue happen to be assigned to us.

Mr. KLEINFELD. As I understand your statement the canner, in a situation where, let's say, chlordane is used as an insecticide and also DDT or some similar substance——

Dr. LEMMON. That is right.

Mr. KLEINFELD. He has a practical method of analysis for chlordane?

Dr. LEMMON. That is right.

Mr. KLEINFELD. The reason I am curious is this—in volume 5, No. 7 of the Food Drug Cosmetic Law Journal, issued September 1950,

there is an article by W. A. Brittin, head of the food laboratory of the Beech-Nut Packing Co., which has been referred to in the past before this committee. He says in part:

> These organic insecticides reached the market for general use before adequate information was available on the acute or chronic toxicity of the chemicals involved. * * * with the exception of one or two insecticides, methods of analyses were lacking which were specific for these various organic spray residues.

And subsequently and more recently, in the April 1951 issue of the same publication, there is an article by Mr. R. K. Phelan, who is assistant research director of the Beech-Nut Packing Co. He states in part:

> Many of the insecticides were introduced only on the basis of their ability to control insects. Frequently, toxicity studies on warm-blooded animals were inadequate and, certainly, no basic work was done on the persistence of the residues in processing or on methods for their determination in the finished product. A major part of the effort in many laboratories has been and still is the development of really satisfactory procedures of analysis for pesticides in common use. Even now the whole problem of insecticide breakdown products and their possible toxicity has hardly been touched.

Now does that not seem to be a disagreement.

Dr. LEMMON. No; there is no disagreement. I agree with that heartily—that we would like to have methods that would be able to pick up, perhaps, a hundredths of a part per million of any one of these chemicals and identify it exactly as that particular chemical. For example, we have a method for parathion that is very good at picking up minor amounts, while some of the methods for our other materials do not distinguish which is which.

As I mentioned here for fresh fruits and vegetables, as a practical basis, I believe the methods we have are sufficient for our purposes. If we wanted to determine, though, which one of those materials was present and how far it penetrated into the surface and in a range of less than a hundredth of a part per million to make a detailed study, other methods would be needed. Two of our chemists are associate referees with the Association of Official Agricultural Chemists. Just as much time as they can spare from routine work is put on helping to improve analytical methods.

Mr. KLEINFELD. Apparently Beech-Nut, at least for one, is by no means satisfied.

Dr. LEMMON. They are doing excellent work there. I am familiar with it and have close cooperation from Beech-Nut, and the work they are doing, I think is very good.

Mr. KLEINFELD. It is an existing problem?

Dr. LEMMON. Surely it is a problem. We all recognize it.

Mr. KLEINFELD. Do you require the manufacturer of an insecticide, when he wants to register his product, to furnish you with information as to the method of analysis of his product?

Dr. LEMMON. In the past there have been one or two materials that have been registered without anything other than an organic chlorine determination for determining the amount of the chemical present. But, in answer to your question, there are so many factors that I hesitate to try to cover all of them now. I cannot answer just "yes" or "no."

We do ask for information on methods. If the product is of a rather highly toxic nature or has, let us say, been associated in the literature or our minds with chronic poisoning, we would ask for more detailed information than we would on one of those less toxic or one, perhaps, that is used as a weed killer where it is not intended to go on food. It would depend on so many different factors as to how complete the method must be before the product can be registered.

Mr. KLEINFELD. I have no further questions.

Dr. HEDRICK. Any further questions?

Mr. HORAN. You mentioned the fact they didn't allow sulfur in canned fruits and vegetables?

Dr. LEMMON. Yes.

Mr. HORAN. But you use sulfur in your driers, do you not?

Dr. LEMMON. That is right. It is not a question of toxicity of it, it is a question of blackening the can and spoiling the produce.

Mr. HORAN. The effect on the can, not on the food?

Dr. LEMMON. Yes. The sulfur contaminates the vegetable, tomatoes, for example, and they had to work out a process to be sure they would remove any sulfur residue so it would not break down the product in the can.

Dr. HEDRICK. Dr. Lemmon, your statement has been very interesting and will be helpful to the committee in planning a law to take care of the situation.

Do you have any suggestions on the type of law that should be prepared, any improvement in the present law, to control insecticides?

Dr. LEMMON. I believe as far as the insecticides are concerned the present Federal law probably could to advantage have one or two minor amendments. I believe Dr. Griffin in his testimony made suggestions. I know Dr. Griffin quite well; have worked with him. I served as president of the Association of Economic Poison Control Officials and have been on the executive committee of that association for a good many years. We always had good cooperation with the Federal office, and I think they are doing a good job.

This question of registration under protest was mentioned. I have never been in favor of that in the Federal law. I think that under the operation of the Federal legal procedure and administration that a manufacturer could unload a highly toxic material by requiring registration under protest, and putting it on the market before anything could be done to stop it from causing injury.

We believe here in California that things like that should be settled ahead of time and there should be prompt procedure to do it. We have a hearing procedure whereby the rights of the manufacturer are protected, in that if we think that the product is not suitable for registration, hearing is held under our Administrative Code; registration is refused or issued according to the facts; and then the applicant has further recourse to the courts directly from that procedure. Perhaps that is a general thing that might be worthy of consideration in connection with all Federal procedure.

I am not a lawyer and I can't express too valid an opinion upon it, other than to say our procedure is working quite well, and I believe both the manufacturers and the people are protected under it.

Dr. HEDRICK. Thank you very much.

Mr. HORAN. Could I ask one more question?

Dr. HEDRICK. Mr. Horan.

Mr. HORAN. Of those samples which you found to be over the tolerance——

Dr. LEMMON. Yes.

Mr. HORAN. How many of those samples came from farms or growers or orchards or vineyards that also shipped in interstate commerce?

Dr. LEMMON. I would not be able to tell. I have no figures to tell which ones were shipped in interstate and which were not. Of the ones in 1950, the 103 samples that were over, I would estimate that none of those were shipped in interstate commerce.

Mr. HORAN. In other words, their source was from a producer who produced largely for the local or intrastate commerce?

Dr. LEMMON. That is correct. Fifteen years ago I was a spray residue inspector on the San Francisco market and also worked on the Los Angeles market. When shipments were received of out-of-State apples with large amounts of lead arsenate they were held for acid-washing for removal of lead arsenate which was the common contaminant at that time. We do not have that problem any more.

Mr. HORAN. That is all, Mr. Chairman.

Dr. HEDRICK. Thank you, Dr. Lemmon.

Dr. LEMMON. Thank you, sir.

Dr. HEDRICK. Who is your next witness?

Mr. KLEINFELD. Dr. Hine.

(The oath was administered by the chairman.)

TESTIMONY OF C. H. HINE, M. D., PH. D., ASSOCIATE CLINICAL PROFESSOR, SCHOOL OF MEDICINE, UNIVERSITY OF CALIFORNIA MEDICAL CENTER, SAN FRANCISCO, CALIF.

Mr. KLEINFELD. Dr. Hine, you are associate clinical professor, School of Medicine, University of California Medical Center, San Francisco?

Dr. HINE. That is correct. Congressman Delaney, chairman of your committee, has requested that I make available any data which I might have relative to the toxicity of chemical substances as food additives and to make a statement on the addition of chemicals to food products. The following is in reply to your request:

By profession I am a physician and a toxicologist. I am familiar with the field of toxicology through my activities as a member of research and teaching institutions and through experience gained in the private practice of industrial toxicology. I have engaged in research problems involving the testing of the nontoxicity of a synthetic food material, the possibility of health problems arising from the accidental contamination of fruits with detergents, and the problem of the possibility of contamination of foods by a plastic packaging material. In addition, I have engaged in toxicologic research on several hundreds of compounds.

I conduct research in toxicologic problems and teach this phase of medicine at the University of California. A summary of my degrees and my professional attainments are appended to this statement.

A toxicologist interested in developments in the field of public health cannot help but be impressed by the magnitude of the problems raised by this committee. The addition of chemical substances to

food materials either inadvertently or intentionally poses a problem of toxicologic and medical importance far beyond the problems which are raised by the introduction of new drugs in the field of therapeutics. This is obviously so because the control of the consumption of food materials is beyond the scope of the physician. Consequently, the incorporation of chemical materials into foodstuffs must be so controlled that there is no appreciable health hazard to the young, the infirm, the aged, or any person who may ingest a chemical in his diet for a number of years.

It should, of course, be recognized that chemical substances are not of themselves essentially harmful. Many of the substances added to food are less toxic than some materials naturally present in foodstuffs. In explanation of this statement, it is necessary for the layman to appreciate that toxicity is intrinsic in any chemical substance; that is, the ability to damage cells is a specific property of matter and that all chemical substances may cause harm to living tissues. Therefore, the question must always be resolved as to the range of concentration of the material known to be noninjurious to man and the duration of exposure. It is my understanding that the addition of chemical substances to food materials is a necessary accompaniment of present-day food technology and without question has improved food standards. Further, it is my understanding that the use of agricultural chemicals greatly increases the quantity of food production. The only reason, therefore, for eliminating any such substances in the production and marketing of food would be if they served no useful purpose, if they were added to conceal a fraudulent or inferior product, or if their presence was harmful to the health of any portion of the population. If we assume that the addition of chemicals is a necessary part of our processing of food in our present complex state of civilization, the question next to answer is "How can it be adequately determined that the addition of such substances is without harm in the ordinary use of the food by the average individual?"

A number of different plans of testing the toxicity of substances which may enter man's body through the gastrointestinal tract have been proposed and are currently employed in different laboratories. A general working principle has been to test the effect of the questioned material on the growth, mortality, and various biochemical functions of a rodent and usually one nonrodent species. Frequently these studies have been extended through the lifetime of one species and have included studies involving reproduction. It is my opinion, however, that at present there is no one satisfactory procedure which can be recognized as acceptable in the investigation of all products. These procedures involving animals do give us a certain approximation of the toxic effects of the chemical substance. However, such studies are only approximations and the final evaluation of harmlessness must, of necessity, always be upon man himself. Such final evaluation is necessary because of the difference between man and even the most closely related species and because of the inability to detect certain changes in experimental animals which cannot provide subjective responses. If it were found through animal experimentation that a compound were to possess only a low order of toxicity but when ingested in foodstuffs was injurious to an appreciable portion of the population, it would obviously be necessary to prohibit its distribution.

To my knowledge, there never has occurred in this country any serious poisonings due to the intentional addition of chemical materials in the processing of foodstuffs which were designed for daily ingestion by healthy individuals. Further, it is my opinion that no significant health problem faces our population at the present time from the use of chemical substances in the growing or processing of food; nor would such a health problem be likely to occur so long as officials in the Federal Food and Drug Administration, in the United State Department of Agriculture, and in equivalent positions in our State bureaus continue to perform their duties as now defined with the skill, integrity, and vigor which they have demonstrated in the past, and so long as responsible chemical manufacturers display the same high regard for public safety which has characterized this industry in the past. It would seem inconceivable to me that any serious problem involving any portion of our population might arise because of the addition of chemical substances to food whose toxicity was either unknown or maliciously concealed. It would be ridiculous for any responsible manufacturer to incorporate into a food material any substance whose toxicity was not known to him. It is barely possible that some small manufacturers through ignorance might distribute within the boundaries of a State, chemicals of worthless or even harmful properties and attempt to promote their use in food materials. However, it has not come to my attention that any such misdoing, either fraudulent or in error, has been purposely perpetrated nor would any amount of legislation by our Federal lawmaking agencies serve to rectify such a mistake.

Industries which are concerned with the development of chemicals for use in food industries should be encouraged to consult the Federal Food and Drug Administration for suggestions in developing data necessary for establishing the safety of the agent for the intended purposes. I do not know whether the Food and Drug Administration is in need of professional aid, but if it is, consideration should be given to the establishment of an impartial board of experts to assist them in their function as advisers and judges. Such a board might well function as a branch of the National Research Council or some other impartial scientific agency and should include known experts in the field of toxicology, animal nutrition, and other related sciences, and who might be drawn from the ranks of universities and industry.

In order to keep the responsible agencies of our Government informed as to new problems in the field of chemical additives, it should be mandatory on the part of the food industry to report the intention of adding such materials in the manufacturing and processing of foods. It is also highly desirable to establish tolerance limits for agricultural contaminants whenever such a limit can be justly defined.

Many toxicologic investigations of medical and public health interest are carried on through the Department of Agriculture and the Food and Drug Administration. I believe that such research programs could profitably be expanded so that these Government groups which are by definition responsible for reaching decisions in problems of toxicology which relate to the subject under discussion may be acquainted with the many current problems in the field. Also publication of their findings for continuing reference by interested parties would greatly facilitate dissemination of current knowledge.

In conclusion, it is my considered opinion that: 1. While the present complexities of manufacturing and processing foodstuffs has raised many problems, there is no apparent significant menace to the public health due to the ingestion of foods which have been treated by agricultural chemicals or to which have been added approved chemical substances. 2. The pretesting of materials containing added chemicals should be performed prior to their release to the general public. 3. Consideration should be given to the appointment of an advisory committee of experts to aid the various Government agencies in problems of toxicology. 4. Present legislation should be left in force, and it should be made mandatory of the food processor to advise appropriate Government bureaus of the intention to add a new chemical substance or process to foodstuffs. 5. Research activities should be encouraged in the appropriate Government agencies, and in university laboratories where proper personnel and facilities exist.

(Dr. Hines' professional training and activities as submitted by him are as follows:)

St. Norbert College, chemistry, B. A., 1937.
University of Wisconsin Graduate School, chemistry, M. A., 1938.
University of Wisconsin Graduate School, pharmacology, toxicology, Ph. D., 1942.
University of Wisconsin Medical School, medicine, M. D., 1943.
1943–47, United States Navy, Medical Corps.
1946–47, Director of Pharmacology and Toxicology Activity, National Naval Medical Center.
1946 to present time, University of California, member of faculty of schools of medicine, public health, and the college of pharmacy. Present academic rank, associate clinical professor.
1947, consulting toxicologist.
Membership in scholarly and professional societies: American Academy of Forensic Science, American Association of Industrial Physicians and Surgeons, American Chemical Society, American Industrial Hygiene Association, American Medical Association, American Society for Pharmacology and Experimental Therapeutics, California Medical Association, Society for Experimental Biology and Medicine.

Mr. McDonough. Dr. Hine, do you know of any instances where there is an accumulated poisoning of human beings as a result of chemical additions to food for the purpose of making it look better, but not adding any food value to it?

Dr. Hine. I do not have any specific information as to that fact. There has been reported a number of instances of minor toxicity without serious involvement to health which have occurred from the addition of food preservatives. I think that the practice in general is highly reprehensible, that the materials that are to be added, or could be added, should be safe and proved so beyond a doubt.

I believe there are cases of mild boric acid toxicity from the use in the old days of borics as preservatives. Nitrates in meat have been reported to give rise to toxic symptoms. The use of monochloracetic acid in beverages has been reported as a source of gastrointestinal irritation.

Mr. McDonough. Polyoxyethylene monostearates, too, bring about a softening of bread to make it appear fresh.

Dr. Hine. I am not familiar with that field. From my brief review of it I don't believe there is any evidence of serious health hazard in those compounds.

Mr. McDONOUGH. Do you think any chemical added to any food product that does not add to the food value but is put there for the purpose of making it more salable should be regulated more stringently than it is now regulated?

Dr. HINE. If evidence is furnished by the person who intends to use it in this way that the compound is safe in the intended use, I think it is perfectly all right.

Mr. McDONOUGH. Even if it does not add any food value?

Dr. HINE. Even if it does not add any food value, since sales promotion is a very important part of everything from medicine to food selling itself.

Mr. McDONOUGH. The unsuspecting public, however, is the victim of that.

Dr. HINE. Not if it is stated that some additive is present in the material. As long as the compound is not added to deliberately cover up a fraudulent product or spoiled product, I think there should be no objection to it.

Mr. McDONOUGH. That is all, Mr. Chairman.

Dr. HEDRICK. Congressman Jones.

Mr. JONES. Pursuing that further—I don't mean to reflect on your industry here in any way—but would not an example of that be the adding of coloring to oranges to promote the sale?

Mr. McDONOUGH. We do not color oranges.

Mr. JONES. You do not color oranges?

Mr. McDONOUGH. No. They do that in Florida. [Laughter.]

Mr. JONES. In other words, you are saying they should not use coloring in Florida oranges to promote their sale?

Mr. McDONOUGH. No; I was not expressing an opinion, I was asking for an answer to a question—as to whether it is advisable to use any material in any food product that the public buys that does not add food value to it but merely makes it look better and more acceptable as far as purchase is concerned.

Mr. JONES. Carrying that on, then, as I understand it, most butter has a coloring added to it to give it a uniform color. And, incidentally, I think, to promote the sale, but that does not destroy any of the food value. I would say it is not intentionally added to deceive the public but to promote the sale, and it does promote the sale but does not do any harm. In other words, you would rather eat yellow butter than to eat white butter—I think I can put it that way, because of our custom of eating butter that is yellow.

Mr. McDONOUGH. That is very true.

Mr. JONES. The same thing in the case of bottled drinks, when they put coloring in there. I know to me a red strawberry soda would taste better, or at least I would have the impression it tastes more like strawberry if it is red than if it were a pink color. I think that shows some of the things you were trying to bring out.

Mr. McDONOUGH. That is right. Of course, we have had testimony in previous hearings on the use of bread softeners, and we found that one manufacturer said he didn't want to use it but had to because his competitors used it. In other words, his bread was softer on the shelf than it was; therefore, he had to add it.

We went further into the question. Experts came in and told us they had fed this material to guinea pigs and monkeys and rats and it was deleterious to many of their vital organs. We had contradic-

tory testimony to that effect. The hearings are full of that kind of testimony, especially on bread softeners.

As a matter of fact, this committee originated because Mr. Keefe of Wisconsin told Congress he thought there was some accumulative poisoning brought about by chemicals in foods and the unsuspecting public was absorbing them in their system.

It is the full intent of this committee to find out if it is being done, whether it is put in there by manufacturers to make it appear better, sell better, whether it gets in there through insecticides, fertilizers, and now through cosmetics.

We presume these witnesses are experts in their knowledge of the facts in the matter, and when we find that one witness says, "No, it has no effect," and another one says, "Yes, it has," the question then for the committee to decide is how far we can go in recommending legislation to control the regulation of any of these kinds of things in foods, fertilizers, insecticides, or cosmetics.

Dr. HINE. Yes, sir.

Mr. MCDONOUGH. This is a statement. I am not asking a question. I agree with you, Mr. Jones, there is a lot of value in the sale of material in coloring it. We had the battle in Congress on colored margarine, and a bill finally passed, you know. Until that time they could not sell colored margarine. The only reason the margarine manufacturers wanted to color margarine was to make it appear like butter to fool the public.

Mr. JONES. Well, I would not agree with you on that, of course. [Laughter.]

Mr. MCDONOUGH. You are a soybean man. [Laughter.]

Mr. JONES. You are talking about the difference of opinions, or even the findings of the experts, and that was brought out with this fluorine in the water. I think you find some experts say it should not be put there, and some say it should, and yet, as was brought out today, when you leave it to the people, I do not think they are particularly impressed one way or another. But some have been told, evidently, that fluorine is beneficial, because a lot of communities have it, but a lot would vote the other way.

To get back to what you are doing here, you have stated three times in your letter you thought the present law had been administered without any harmful effect on the public; that as far as you knew from the inclusion of chemicals in foodstuffs you did not recall any cases where we had had harmful effects; is that correct?

Dr. HINE. Yes, sir. I have certain qualifications to that.

Mr. JONES. You did go on and say you thought we could still make improvements in the law though?

Dr. HINE. Yes, sir. I also had certain qualifications to the statement that any material that had been added—since I think there are instances—I don't recall whether it appears in here in my letter, but I stated in the——

Mr. JONES. In your first conclusion, you repeated a statement that had been made, I think, twice before.

Dr. HINE. Yes, sir, that—

there is no apparent significant menace to the public health due to the ingestion of foods which have been treated by agricultural chemicals or to which have been added approved chemical substances.

I firmly believe in that statement. There is no apparent significant menace to public health.

Mr. JONES. Of course, we always get on the subject of DDT. Have you observed in any of your investigations any harmful effects that have resulted to human beings through the ingestion of DDT either through milk products or meat products, or any other way?

Dr. HINE. No, sir. I have referred to me quite frequently cases in differential diagnosis where the possibility of poisoning exists. I have seen quite a few people who have been reported to have been exposed to DDT, or who were in the area of the spraying of DDT, and have eaten food material from their own home afterward who thought there was some change in health because of this exposure. On examination, I have never found any significant deviation in body physiology or the general health of the individual to substantiate such claim.

I should make the exception that occasionally industrial exposures do result in this, and I am referring now to nonauthenticated cases of actual heavy exposure where exposure occurred as a result of transcontamination of food material. In those I have seen no change.

In people who have been exposed to DDT through intimate contact or with a number of other agricultural chemicals, I have seen changes in the individual which have, to my knowledge, in the cases I have been able to follow up, been entirely reversible. But I have never seen cases of poisoning which have resulted from accidental ingestion of materials which have been accidentally contaminated with DDT.

Mr. JONES. I have no more questions.

Dr. HEDRICK. Mr. Horan.

Mr. HORAN. You stated, did you not, that in your opinion pesticides, as they are used, now do not create a dangerous toxic condition in the human body?

Dr. HINE. Well, I don't believe I made that statement in just that way, sir. Certainly there have been a number of poisonings from the application of agricultural chemicals. The bureau of adult health has a good number of them, about 300 or so, a year. That is in the workman who is applying the material or in the case of accidental exposure to large quantities of DDT.

But to my knowledge, from the ingestion of foodstuffs containing DDT by man, or other agricultural chemicals, when the material has been there in the quantity that would be expected to be present following reasonable agricultural application, there have never been any cases of poisoning to my knowledge.

Mr. HORAN. If an insecticide is applied according to the instructions of the manufacturer, there would not be apt to be any dangerous results even to the applicator, and certainly not the consumer?

Dr. HINE. That is correct. The majority of agricultural chemicals are well labeled in order to avoid those accidents. But accidents do occur through human and mechanical failure.

Mr. HORAN. That is all, Mr. Chairman.

Dr. HEDRICK. Do you have any further questions, Mr. McDonough?

Mr. MCDONOUGH. No.

Dr. HEDRICK. Mr. Kleinfeld.

Mr. KLEINFELD. Dr. Hine, you say on page 3 of your statement that it is your opinion—

that no significant health problem faces our population at the present time from the use of chemical substances in the growing or processing of food.

And on page 4 you say—

It would be ridiculous for any responsible manufacturer to incorporate into a food material any substance whose toxicity was not known to him.

Are you familiar with the food protection committee of the National Research Council?

Dr. HINE. Yes, sir, I know of them. I have never served as a member of their group.

Mr. KLEINFELD. It is a highly reputable organization?

Dr. HINE. Yes, sir.

Mr. KLEINFELD. Not a governmental group?

Dr. HINE. No, it is not.

Mr. KLEINFELD. On June 11, 1951, that group issued a statement on the use of surface-active agents in foods which covers both the use of the mono- and diglycerides and the polyoxyethylene monosterate types of surface-active agents. This is what that committee of the National Research Council said in part:

It is our considered opinion that the data available to us on the toxicity, tolerance, metabolic fate, and nutritive value of these surface-active agents proposed for use in ice cream are insufficient to permit a final judgment as to the safety of the substances for use in foods.

Now these surface-active agents are used in many types of food—bread and other bakery products, meat, and so on.

Dr. HINE. Yes.

Mr. KLEINFELD. What do you believe should be done with a situation such as this, where a body, such as this committee, finds that the data is insufficient to permit a final judgment as to the safety of the substance? Do you think the substance should be used?

Dr. HINE. Well, I have a great deal of respect for the opinion of the persons who are members of that body, and I presume they have given the statement based on their knowledge of all the evidence available. Therefore, I think, if the situation exists, that any manufacturers who are familiar with their statements should probably be guided by it, and would then hesitate to use a surface-active agent; or if he did so, the information that his experts had given to him would be of sufficient weight in his mind in order for him to proceed with the use of it.

Mr. KLEINFELD. Well, in a subsequent statement by the same committee on August 8, 1951, this statement appears, and I want to read it to you to see if you concur in it:

The statement—

referring to the prior statement—

was based on the research data made available and examined in the light of the "Basic Principles Involved in Evaluating Safety in the Use of Chemical Additives in Foods," released by the Committee on Food Protection, June 11, 1951. It expressed the committee's considered opinion that the research data and the information concerning use of the surface-active materials were insufficient to reach a sound estimate of the safety or hazard presented by their use in foods. The committee recognized that additional research is in progress in several laboratories which, when completed, may supply data on which to base a judgment regarding the safety or hazard of some of these materials. When available, such data will be reviewed by the committee. The statement was not intended to question the continued use in foods of surface-active materials that are permitted by existing or officially proposed standards of identity.

Now what is your judgment with respect to substances such as these two groups, used as widely as they are used, where apparently there is a doubt as to whether the data is sufficient to permit a final judgment as to the safety of the substances—what is your opinion as to whether they should continue to be used in these various food products?

Dr. HINE. Well, sir, I can only give an authoritative opinion on the evaluation of the data that would be presented. It is apparently the opinion of this group that the data shows neither hazards, as you read, nor safety in the intended use. I presume that further work is in order to establish the answer to this question.

However, I did not understand the qualification of the committee in saying that they did not object to the use of approved agents at the present time. I did not follow that particular point. Perhaps it is not important.

Mr. KLEINFELD. The reason I ask is because I think you said in your statement that until a product was proven to be safe it should not be used.

Dr. HINE. Yes, sir. That raises a very interesting question of what is proof. Proof is a question of degree, and is never absolute within a shadow of a doubt. We can go on testing these products, as Dr. Hoskins and you debated this morning, to some finite position where you can or cannot arrive at a decision as to whether the material is safe or hazardous. I think that the only methods that are available to us are to use, first, our animal toxicity tests, and then follow the study with compilation of data on people who have been exposed in the handling of this material—the chemists who manufacture it, the operators who make it, the different scientific investigators who work with it—in order to see if it is deleterious. This has to be followed up by studies in selected groups of population in order to absolutely assure oneself there is no hazard.

I think probably the only answer to this particular question is to observe—since there is no apparent hazard to the material, even though the safety has not been proved, is to allow the material to be sold, and so observe very closely through our State bureaus, our Government agencies, who are equipped to do this sort of statistical examination, the possibility of untoward effects developing from the use of a product over a period of time.

Mr. KLEINFELD. Is not that what you would call the human-guinea-pig approach?

Dr. HINE. If these materials—no; I would not like to term it a human-guinea-pig approach. But as a clinician and a medical man, and one who deals with human beings primarily and not with animals, except in rare instances, I think that the only test for the safety of the material is the test on man, which has to be predicated and prefaced by very expensive animal tests. But your final answer can only be an evaluation of material on man, because, as I pointed out, due to the difference between man and animals, the material may prove absolutely safe through the most rigid animal tests the Food and Drug, or any other laboratory can now envision. Yet, when given out to the population at large, you may have some severe reactions, and it will have to be taken off the market.

Our final criteria must be always the fact it is not injurious to man in a product intended for use by man.

Mr. KLEINFELD. Let's take an actual situation. Here is a food manufacturer or chemical manufacturer who comes along with a product—let's take the polyoxyethylene type of product—that is going to be used in a number of different foods, basic commodities, bread, ice cream, and many other products, consumed widely by large portions of the population, the young and old, the sick and strong. And the products are to be used, let us say, to make bread appear softer.

Now would you or would you not require the food manufacturer or the chemical manufacturer to satisfy some tribunal, some agency, that his substance is safe before it is actually used in food? Or would you require that the Government prove that it is unsafe?

Dr. HINE. Well, I think that the latter question is the pragmatic one, the practical one. From the law's standpoint, I presume we have to answer the first one. We must be able to answer that the material is safe to the best of our ability, with the realization that there is a time factor from the economic standpoint that precludes testing beyond a certain point; and, if no hazard appears within a given specified duration of testing, that the compound must be assumed to be suitable for general release.

Mr. KLEINFELD. But who is going to make the decision as to whether or not the product is safe?

Dr. HINE. I think you have referred to the one advisory group here, to the National Research Council, and the Food and Drug people themselves in Washington have adequate power to decide whether or not they think at the present time a material is safe.

You can go to the various State agencies—Mr. Lemmon, Mr. Duffy—the different bureaus represented here this morning. They will, upon reviewing data, give us the answer as best we are able to obtain it.

Mr. KLEINFELD. I am not giving you a hypothetical case. Here is an actual situation where we have a substance which is as widely used as I have mentioned, and the kind of agency I have mentioned has said that it cannot say, on the basis of all the data it has examined that the substance is safe. Do you believe it should be used, that we should examine people who consume it, and if it causes trouble we should then stop using it?

Dr. HINE. Yes, sir; I think that is exactly the situation that exists today with the Food and Drug activities in the new drug field. They never O. K. a product and say it is safe to use, but after examining the best evidence that is presented, they will allow use under controlled conditions until it can be established within a period of a year or so whether the product is safe. Then at any time, it is my understanding, the compound can be removed from the market if after even these tests it proves to be a toxic or deleterious substance to any portion of the population, unless the warnings for use of the food are so well guarded that it would limit its use by a small group that might be specifically injured.

Mr. KLEINFELD. As far as new drugs are concerned, the law now specifically provides that no new drug may be placed on the market at all unless it is first established by the manufacturer, to the satisfaction of the Food and Drug Administration, that the drug is safe.

Dr. HINE. Yes, sir.

Mr. KLEINFELD. Under the proposed conditions of use.

Dr. HINE. Yes, sir.

Mr. KLEINFELD. Do you feel the law should be different as far as chemicals in food are concerned?

Dr. HINE. No; I think the basic tenet of the law, the spirit of those two, should be in agreement. However, I don't see practically how this can be brought about under present conditions at the present time.

Mr. KLEINFELD. They do it with new drugs.

Dr. HINE. But there are a limited number of new drugs that are always used under very specific conditions and very adequate control, and the number of agricultural chemicals coming in the field are tremendous.

Mr. HORAN. May I ask a question?

Dr. HEDRICK. Yes.

Mr. HORAN. Are you familiar with the work that the Public Health Service is doing up in Wenatchee and are starting to do this winter at the marine hospital in Seattle?

Dr. HINE. I believe that is a study of the—are you referring to the study of people who are exposed to parathion?

Mr. HORAN. Yes. I want to clarify, in the interest of the people who live in the communities where pesticides have to be used, the reaction that our society in general has against people being referred to as guinea pigs.

We will hold some hearings in New York City, and, of course, they will be up in arms for fear that they might be referred to as guinea pigs or might inadvertently be put in that class. However, I think we should make a distinction—and I believe you will agree with me—between those selected groups who volunteer or during a case of surgery allow part of their fat to be analyzed, taken from the abdomen or elsewhere, and those who might come under the heading of guinea pigs, where vivisection occurs and all that sort of thing, and the ultimate intent is to kill the animal. In our research now the ultimate objective is to increase life and prolong it.

Dr. HINE. Yes.

Mr. HORAN. And at Wenatchee we are now—you saw them, Mr. Kleinfeld. We observed samples of fatty tissue taken from the human body, with the consent of the person involved, and in each case with a history of the known exposure to certain insecticides. It is intended to take those who mix and those who prepare the insecticides for dosage, and those who apply it, take those individuals over to Seattle and give them an extended physical check-up over a period of from 3 to 4 weeks, and to take blood tests and other means to find out what the effect on the body itself, the metabolism, and so forth, is from the exposures to insecticides. We are doing that as a sort of community service. People out here in the food-producing areas are aware of the difficulties and are anxious to cooperate to arrive at conclusions. I wanted to interject that and to have the record show that in this whole field people out here are very willing to volunteer for service in these selected groups if they can be of service to the industry and to their neighbors.

Dr. HINE. Yes, sir; that is a very interesting comment. I think that it shows that the Government is interested in the problem as well as the private manufacturer.

American Cyanamid, I understand, has conducted a rather extensive study of the effects of their particular agricultural posion, parathion, on the people in that area. This is a nice furthering of the research done by that private group.

I would just like to make one last statement about guinea pigs. No one likes to be called a guinea pig, and the reason we don't like to be called a guinea pig, I suppose, to the layman the chance of survival of the individual guinea pig from the laboratory experiment is relatively poor. However, we are all guinea pigs. We are guinea pigs in life right now as far as agricultural chemicals are concerned.

From the best available data made in good faith, there is no presumable hazard to a man in ingestion of food containing the agricultural chemicals in the tolerance limits that have been set by the various Government groups in Washington. But we don't know 10 or 15 years from now whether it will or will not show some deleterious effect. For that reason we are serving as a very large group of test subjects at the present time.

My point in making that statement is that the data, the procedure, should always be based on the best available data of the responsible groups, and when we have exhausted that data on experimental animals, we have to go to mankind in order to gain the final answer.

Mr. McDonough. Mr. Chairman.

Dr. Hedrick. Mr. McDonough.

Mr. McDonough. Dr. Hine, do you think there is any relationship between the frequency of heart attacks, osteomylitis, or any of the unusual diseases that have become quite common in the last 10 years—any relationship between that and the processing of foods or the use of insecticides in trying to kill pests in foods and cumulative poisoning in the system—cancer, for instance?

Dr. Hine. Yes; I believe there is some relation. The relationship is probably that there are less actual cases caused by insect vectors, because of the use of agricultural chemicals and their control than there would have been formerly. No specific disease is mentioned. I don't think any insect vectors were concerned. I am sorry, I have forgotten them. But in general, disease transmission has decreased through the use of agricultural chemicals, and the general nutrition and food intake of the population has increase, therefore making a more resistant population to infectious disease.

Mr. McDonough. You reversed the question. What I asked you is, Do you think that the prevalence of chemicals in the processing of foods and those that come there accidentally have any relationship to the increase in heart disease, heart trouble, cancer, polio, or any of those sorts of diseases?

Dr. Hine. No; none whatever.

Mr. McDonough. You do not think so?

Dr. Hine. No.

Mr. McDonough. You do not think any increase is due to that or due to lack of control of those chemicals?

Dr. Hine. No, sir.

Mr. Jones. I have one more question following his question there. Is not our method of diagnosis and the exactness with which we can

diagnose now partially responsible for the increase in some of these diseases over, say, a few years ago when those people probably died of the same disease but it was diagnosed as indigestion or something else?

Dr. HINE. Yes, sir; I think there has been a great improvement in the accuracy of diagnosis and also of the frequency with which sick people attend clinics, so that a diagnosis can be made.

Mr. JONES. The fact that our death rate has gone down might even indicate that we are having less of those types of cases today than we had years ago even. I don't know whether you want to agree with that or not.

Mr. MCDONOUGH. The life cycle has increased, too.

Mr. JONES. Surely.

Mr. MCDONOUGH. Increased by 15 years in the last 50 years.

Mr. JONES. And your death rate has decreased.

Mr. MCDONOUGH. Oh, yes.

Mr. JONES. And similarly we might have an increase in a particular type of disease and have a greater recorded number of that disease due to the diagnosis today as compared with a few years ago.

Mr. MCDONOUGH. That is correct.

Dr. HEDRICK. Doctor, as a physician, you are familiar with the estrogenic hormone, are you not?

Dr. HINE. The what?

Dr. HEDRICK. You are familiar with the estrogenic hormone?

Dr. HINE. Very vaguely.

Dr. HEDRICK. You studied it when a medical student, I am sure.

Dr. HINE. Yes, sir. I don't deal with it.

Dr. HEDRICK. What is your opinion about the effect of estrogen in face creams?

Dr. HINE. I don't think I can give an authoritative answer on that, sir. I think this is a case in which there has not been enough evidence yet to indicate it has a deleterious effect, and I certainly would question the positive effects that it is purported to give.

Dr. HEDRICK. In your knowledge, have you ever heard of estrogenic hormones being responsible for cancer?

Dr. HINE. Only in experimental work, sir. I think large dosages of estrogenic compounds have a certain toxicity themselves. I am familiar with that, and I am also familiar with the fact that they may modify or change the course of prognosis of cancer slightly once it is established. But I am not familiar with the fact that these estrogens have ever promoted cancer.

Dr. HEDRICK. Do you believe it is generally believed they do promote cancer? Have you ever heard of that?

Dr. HINE. I have heard the statement.

Dr. HEDRICK. Do you think it has ever been proven?

Dr. HINE. No, sir.

Dr. HEDRICK. Any other questions?

Thank you very much, sir.

Dr. HINE. Thank you.

Dr. HEDRICK. Who is the next witness?

Mr. KLEINFELD. Dr. Esty.

(The oath was administered by the chairman.)

TESTIMONY OF J. RUSSELL ESTY, PH. D., DIRECTOR, NATIONAL CANNERS ASSOCIATION RESEARCH LABORATORIES, BERKELEY, CALIF.

Mr. KLEINFELD. Dr. Esty, what is your academic background?

Dr. ESTY. I graduated from Rhode Island State College in 1914 with the degree of bachelor of science, in chemical engineering; received a master's degree in 1915 at Brown University, and Ph. D. at Brown in 1918, and for both degrees I majored in bacteriology and minored in biochemistry.

Mr. KLEINFELD. What is your present position?

Dr. ESTY. Director of the Western Branch Laboratory of the National Canners Association.

Mr. KLEINFELD. Generally speaking, what are your duties?

Dr. ESTY. I became acting director of the Western Branch Laboratory in 1926. I was made director in 1927.

The work of the Western Branch Laboratory is to give technical service to the commercial canning industry and to conduct research on canning problems. The laboratory serves the western region, which is the Pacific Coast States, the Intermountain States and the Hawaiian Islands. We have as our main responsibility over 300 canning companies operating in this region.

Mr. KLEINFELD. Will you please read your statement?

Dr. ESTY. Dr. E. J. Cameron, director of the Washington laboratory of the National Canners Association, testifying before your committee on December 1, 1950, and speaking on behalf of the canning industry, discussed the main kinds of canned foods and their ingredients. He pointed out that the canning industry is not indifferent to the added chemical problem but that the area of interest is limited by the nature of most canned foods and by the controls already in effect. He stated that canned foods which have been standardized under the Federal Food, Drug, and Cosmetic Act of 1938 constitute a major part of the pack. Of the number of products which have not yet been standardized, a large proportion consists of those which are too simple to have made standardization urgent or are of substantially identical nature to the standardized products.

In broad aspect, it would appear that the canning and frozen foods industries are concerned primarily with the unavoidable presence of pesticide residues on certain food crops, and we agree with Dr. Cameron that this constitutes an important chemical problem to the food groups. It is also important to consumers from a public health standpoint because a wide variety of agricultural products for food use are affected, regardless of the form in which they may be marketed.

Fortunately certain crops which are canned or frozen in large volume either enjoy the protection of an inedible exterior sheath which prevents the deposition of residues on the surface of the edible parts or are subjected to preparatory operations in canning, e. g., peeling, which effectively remove any surface-borne residues which might be present. For example, in the canning or freezing of corn and peas, two of the major items of canned and frozen foods, any surface contamination from insecticides used to control insects is removed with the husks and pods. This has been confirmed by many analyses of the finished products. Also, in the case of products which are peeled, such

as peaches, pears, and tomatoes, the insecticides used are removed. The insecticide residue problem is more troublesome in those canning crops which do not have a protective sheath and which are of such nature that the preparatory operations do not and cannot remove any of the exterior surfaces. Products in this group, such as apricots, prunes, and green beans, have received particular attention by industry laboratories as well as by State agricultural research and advisory bodies concerned with pest control.

It is my understanding that you desire me to testify concerning experiences with insecticide residues in the canning industry. In discussing insecticide usage in the canning industry, it may be noted that a large number of freezers of fruits and vegetables are also canner members of the National Canners Association, and there has been a free interchange of information in regard to the use of pesticides. I can say, therefore, that agricultural practices and preparation treatments of fruits and vegetables conceivably affecting the elimination of pesticide residues are similar up to the point of processing by heating or freezing.

In preparing this statement I have consulted with technical representatives connected with the canning and frozen foods industries and have had an opportunity to consider their data, based upon a large number of samples from surveys of products treated with insecticides and from numerous residue analyses made as a routine control procedure. For many years the National Canners Association has been called upon to test products for the presence of various insecticides and to investigate the efficiency of certain washing procedures for removing insecticidal residues; hence, this problem is not new to us and our knowledge is fairly comprehensive and up to date.

You may know that many canning companies have their own laboratories for food-control purposes, primarily to have a continuous check on the purity and quality of the products they manufacture and to determine whether their products meet Government standards. Some of these companies also conduct technological research and make experimental packs with a view to improving their products or operations. In this way the industry continues to refine procedures, develop better methods of processing, and operate more efficiently. A part of the industry's program is to work cooperatively and to pool its resources and findings in order to avoid unnecessary duplication and to have an industry-wide sharing of experience with problems of common interest. An example of this is the work being done on insecticide residues.

The Western Branch Research Laboratories of the National Canners Association have cooperated with outside agencies in a study of insecticides for the control of insects affecting apricots, green beans, and tomatoes.

The use of DDT, DDD, and parathion on apricots has received considerable attention, largely due to the necessity of applying control measures for codling moth, both to prevent economic loss to the grower and to prevent contamination of the canned product with worm and insect fragments. The residue problem involved in the use of these insecticides on apricots was investigated during the 1948 and 1949 seasons, using trees sprayed experimentally by A. D. Borden and his associates in the department of entomology, University of California. During the 1949 season methoxychlor was included, and the residue

studies included a commercial washing experiment in order to determine the efficiency of residue removal under strictly commercial operating conditions and also under the most rigorous mechanical conditions commercially available, regardless of the damage to the soft, ripe fruit.

The data indicated that parathion at 0.5 and 0.75 pound per 100 gallons can be used up to a month before harvest without leaving a detectable residue in the canned product, although traces were found on the raw fruit prior to washing.

DDT, DDD, and methoxychlor seemed to behave similarly with respect to their persistency. Methoxychlor, owing to its higher rate of application, left the most residue on the raw fruit. Although there was about a 50-percent loss due to weathering during the last 2 weeks prior to harvest, small amounts of these substances seemed to be unusually resistant to weathering and persisted even when applied to the fruit in the jacket stage (after fall of petals but while small fruit is still enclosed in the floral parts). When I refer to small amounts, I mean from one-tenth to three-tenths parts per million.

These small amounts of residue were also unusually resistant to washing, even under the most rigorous conditions, and chemical treatments appeared to be ineffective in removing them.

It is of interest to note that under the conditions of these experiments the time of application of DDT, whether in May or in June, made very little difference in the amount of residue in the canned products, and even application in April at the jacket period resulted in only slightly less DDT in the final product. The amount of residue remaining on the fruit at harvest appeared to depend more upon the number of spray applications than upon the time of application.

On this subject Dr. Arthur D. Borden of the department of entomology of the University of California [1] reports:

> The application of a spray in the jacket period on apricots, appears to be justified in that it will control fruit-tree leaf roller, tussock moth, peach-twig borer, orange tortrix, case bearer, and codling moth. The addition of a copper compound in the spray is advisable where brown rot is apt to be a problem. Wettable powders, of DDT, DDD, parathion, or methoxychlor may be used in this application.
>
> A second application in May to give protection against the codling moth emerging in May and early June is a necessity where codling moth is a problem. This spray should be applied a month or 6 weeks before the first picking. Wettable DDT should never be employed in this spray due to its residual properties and toxicity. The use of DDD in this spray may also be restricted due to its residual properties. Although its toxicity as a spray residue is much less than that of DDT its use will depend upon the amounts permitted as spray residue tolerances on fresh and processed fruit.
>
> The low residues of parathion after a 30-day period make it safe to use.
>
> The low toxicity of methoxychlor should make it safe from a residue point of view even though it does leave considerable residue after spraying.

During the 1949, 1950, and 1951 apricot seasons industry laboratories in California compiled information on the orchard practices of their growers with respect to the use of insecticides of a kind and/or at a time during the crop growth which might be of significance from a residue hazard standpoint. The surveys showed that for the most part growers in California were following closely the

[1] Spray residues on apricots after codling moth sprays, 1950 recommendations, Arthur D. Borden, Harold Madsen, and Stanley Benedict. California Agriculture March 1950.

recommendations of the California agricultural advisory agencies as to the selection of pesticides and their use. An analysis of samples of fresh fruit taken from cannery deliveries and representing many orchards provided substantial evidence that the insecticide treatments and schedules recommended by the State agencies do not leave residues on the fresh fruit which could be regarded as hazardous in light of present knowledge of their chronic toxicities.

Similar surveys and analyses on California prunes indicate good compliance by growers with the spray schedules recommended by the California agricultural advisory agencies in that residues in the final product could not be regarded as hazardous.

The use of insecticides on green beans in the Pacific Northwest has been necessary for the control of the western spotted cucumber beetle, *Diabotica undecipunctata* and/or for the black bean aphis, *Aphis rumicis*. We have conducted studies to obtain information on the possible residue hazard resulting from the use of various insecticides on green beans, with particular reference to the canned products. The work was done cooperatively with Dr. Mote and his associates in the department of entomology, Oregon State College. The following insecticides were studied: DDT dust, DDT spray, methoxychlor, and parathion. All of the residues, including those obtained on the beans immediately after application, were comparatively low. In every case less than 1 part per million of DDT was found. Except for the sample of beans canned immediately after application, no more than a trace of parathion was detected. These results would indicate that for all practical considerations all of the parathion disappeared during the 4-day weathering period to which the beans were subjected. Although regarded as being of no particular significance, the data indicated also that slightly more methoxychlor than DDT remained in the canned beans, probably as a result of the higher rate of application of methoxychlor than of DDT.

Working with Dr. Michelbacher and his associates in the department of entomology of the University of California [2] since 1946, we have made residue studies on several of the newer organic insecticides applied to tomatoes. Studies in 1946 and 1947 indicated that DDT and DDD showed considerable promise in controlling the important insects attacking tomatoes and that these new materials were much more effective than calcium arsenate. A 10-percent toxaphene dust was found to be about as effective as calcium arsenate for insect control on tomatoes. They also indicated that when used at the rates recommended, DDT and DDD would not present a residue hazard.

Further investigations on tomatoes were conducted in 1948 because certain canners were still somewhat reluctant to allow their growers to use these insecticides without additional assurance that there would be no serious residue hazard. The materials used in the 1948 experiments were calcium arsenate, DDT, DDD, methoxychlor, and toxaphene. Frequently sulfur was used in combination with the aforementioned materials to provide mite control. The 1948 season marked the second year in which DDT and DDD were used on a commercial scale in California for the control of insects damaging tomatoes. The results of the 1948 studies provided substantial confirmation of

[2] Further investigation of control of tomato insects in northern California, A. E. Michelbacher, W. E. Middlekauff, Frank C. Lamb, and N. B. Akesson, Journal of Economic Entomology 42 (4), 666 (1949).

earlier work, in that they disclosed a definite concentration of insecticide residues in the waste materials discarded during the canning operations. Those surface-borne residues which persist beyond the washing operations remain tenaciously associated with the skin of the tomatoes and are almost entirely eliminated as waste.

The data further showed that residues of calcium arsenate, although present in larger amounts than DDT or DDD on unwashed tomatoes, were more readily removed in the wash with the result that after washing the concentration of calcium arsenate was about the same as that of DDT and DDD. Under the conditions of the experiments, the residual amounts of DDT, DDD, methoxychlor, or calicum arsenate found on the washed fruits are believed to be insignificant in light of present knowledge of safe limits. A further and substantial elimination of these small residues occurs in peeling the tomatoes for canning as peeled tomatoes or in manufacturing various tomato products in the course of which the skin is removed by screening. In no case in the samples from the test blocks did the residue in the tomato-juice samples exceed 0.1 parts per million. The wastes ran from 0.5 to 1.7 parts per million. Toxaphene, a material not in general use at the present time on tomatoes, in one case gave a residue of 0.8 parts per million in the juice.

One aspect of the problem concerning the use of pesticides on canning crops is the effect of these materials on the flavor of canned foods. It is a well known fact that certain of the insecticidal chemicals, of which BHC is an example, have an adverse effect on the flavor of certain products. With the advent of a large number of new compounds on the market, it is imperative that some procedure for the systematic checking of these materials be developed that will protect the canning industry from loss resulting from the use of pesticides which may have a deleterious effect on the quality and marketability of its products.

In June of this year an industry meeting was held to consider this problem, and a committee named the Canning Industry Technical Steering Committee on Pesticides was formed to assist in organizing a research program to investigate the effect of these materials on the flavor of canned foods. This committee is composed of technical representatives from all branches of the fruit-and-vegetable-canning industry. The committee proposed that a cooperative program of research be conducted by the departments of entomology and food technology of the University of California and California Agricultural Experiment Station, with technical assistance to be provided by the canning industry. The three phases of this program would be treatment of the crops with the selected pesticides by the department of entomology, processing of the raw materials, and taste-testing of the finished products by the department of food technology. Only pesticides in the final stages of testing by the experiment station preparatory to recommendation to growers by the Agricultural Extension Service were to be tested.

To initiate this program packs of strained pears, tomato juice, and orange juice were made during the past canning seasons. Residue analyses on the treated fruit are to be made—these are to be made by Dr. Hoskins—and the flavor evaluated by taste panels because the committee feels that such a program of flavor evaluation is an essen-

tial phase of insecticide research in the production of quality canned products.

Thank you.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. No questions.

Dr. HEDRICK. Mr. Horan.

Mr. HORAN. No questions.

Dr. HEDRICK. Mr. McDonough.

Mr. MCDONOUGH. No.

Dr. HEDRICK. Doctor, we thank you very much for your statement.

Mr. KLEINFELD. I would like to ask a few questions.

Dr. HEDRICK. Mr. Kleinfeld.

Mr. KLEINFELD. Doctor Esty, what was the reason for the creation of the Western Branch Research Laboratory?

Dr. ESTY. Primarily to make further studies of botulinus investigations. The industry had a problem in 1919 when ripe olives killed a few people in the Middle West. The canning industry gave the University of California and Stanford University grants to make a fundamental study of botulism including the distribution of the causative organism, heat resistance, and other phases. That work continued for 2 years, at the University of California under the direction of Dr. Karl Meyer and at Stanford Medical School by Dr. E. C. Dickson. I came out during that time and assisted the group.

Mr. KLEINFELD. And then you went into the question of spray residues?

Dr. ESTY. That is right.

Mr. KLEINFELD. What insecticides have you had trouble with?

Dr. ESTY. Of these three products that I have mentioned and the materials that have been used, the ones that we have given particular attention to are the arsenicals, DDT, DDD, methoxychlor, and parathion.

Mr. KLEINFELD. When recommendations with respect to the use of various of these insecticides are made, are the recommendations checked with the Food and Drug Administration?

Dr. ESTY. Yes, sir.

Mr. KLEINFELD. Who does the checking—members of your organization or representatives of the insecticide manufacturer?

Dr. ESTY. As far as we are concerned, representing the canning industry, we confer with the Food and Drug Administration.

Mr. KLEINFELD. With respect to all the recommendations made as to the use of insecticides on specific crops?

Dr. ESTY. Yes.

Mr. KLEINFELD. As far as off-flavors are concerned, have they been caused primarily by benzene hexachloride and lindane?

Dr. ESTY. Those are the two products with which we are particularly concerned.

Mr. KLEINFELD. What recommendation would you make to meet that difficulty from the viewpoint of the canner?

Dr. ESTY. This program that has been set up with the California Agricultural Experiment Station and the division of food technology in the University of California seems to us to be the logical means of screening materials for off-flavor.

Mr. KLEINFELD. Could you list in order of importance the insecticides which have caused canners of California the most trouble?

Dr. ESTY. I don't think I am competent to do that.

Mr. KLEINFELD. Are there any other chemicals besides benzene hexachloride which have caused off-flavor?

Dr. ESTY. The experimental packs that were prepared this season to which I referred were prepared because there is lack of knowledge as to the possible effect on the flavor of the products. That is the reason for the experimental work.

Mr. KLEINFELD. Has the use of aldrin caused any off-flavor?

Dr. ESTY. I don't know.

Mr. KLEINFELD. How about lindane?

Dr. ESTY. I don't know.

Mr. KLEINFELD. You don't know?

Dr. ESTY. No.

Mr. KLEINFELD. DDT has been used on peas; is that correct?

Dr. ESTY. That is right.

Mr. KLEINFELD. Do you know what happens to the pea vine?

Dr. ESTY. Yes, sir.

Mr. KLEINFELD. What happens to it?

Dr. ESTY. They have been used for feed, stored at the time the peas are vined, and then up to the time that the DDT was the controlling agent, they were used for feed.

Mr. KLEINFELD. And the canners sell the pea vines to the farmers for fodder?

Dr. ESTY. That is right.

Mr. KLEINFELD. Don't these pea vines contain a DDT residue?

Dr. ESTY. That is right. My statement was, however, that up to the time that DDT was used—since DDT has been used, as far as I know, the vines that are particularly contaminated with DDT are not used for feed.

Mr. KLEINFELD. But is it not a fact that many of the vines which are sold by the packers do contain a DDT residue?

Dr. ESTY. I don't know that.

Mr. KLEINFELD. You do know that some canners sell them for fodder?

Dr. ESTY. That is right.

Mr. KLEINFELD. You are aware of the fact that the consumption of DDT by animals will cause an accumulation of DDT in the animals?

Dr. ESTY. I understand so.

Mr. KLEINFELD. Is DDT still used on peas?

Dr. ESTY. To a limited extent.

Mr. KLEINFELD. Do you think the canners should sell pea vines containing DDT?

Dr. ESTY. Not if the DDT is there in amounts that would affect the animals or the milk.

Mr. KLEINFELD. No matter what the amounts are, would it not store up in the animal?

Dr. ESTY. I don't know.

Mr. KLEINFELD. Why did the canners find it necessary to go out to the University of California and ask the university to set up a program such as you have mentioned?

Dr. ESTY. Well, the department of entomology of the University of California and the California Experiment Station have for many years been the agencies to recommend materials. They have the per-

sonnel and the facilities, and they are independent agencies. It seemed to the industry they would be the proper authority.

Mr. KLEINFELD. Were you finding a problem—why did you go to them at all? You asked them to set up a program; right?

Dr. ESTY. That is right.

Mr. KLEINFELD. What was the specific reason for it? Were you meeting with some difficulties or not?

Dr. ESTY. Because of the off-flavor problem developed in benzene hexachloride. That is one of the suspicions we have—and maybe some of these other new materials might impart an off-flavor.

Mr. KLEINFELD. Any other reason?

Dr. ESTY. That is all.

Mr. KLEINFELD. You did not go there at all because of any spray-residue problems?

Dr. ESTY. I am not sure I understand your question. Is it that we went to the university to do this work on apricots and tomatoes?

Mr. KLEINFELD. You went to the university and asked them to set up a certain program on apricots?

Dr. ESTY. That is right.

Mr. KLEINFELD. On anything else?

Dr. ESTY. On tomatoes.

Mr. KLEINFELD. Was that in part because you were meeting some problem with insecticidal residues?

Mr. ESTY. It was because they had the proper materials and the proper organization to treat those products, and then we could take the product and run it through the cannery and have material available to see what the effect of the canning process would be on products that were treated under known conditions.

Mr. KLEINFELD. Well, is it not a fact, Dr. Esty, that the canners were and are concerned with the DDT-residue problem on apricots?

Dr. ESTY. That is correct.

Mr. KLEINFELD. Wasn't that one reason you had them set up this program?

Dr. ESTY. It is a question of doing it cooperatively, because they were already doing it. They were using these materials in order to control the pests, and we were interested from the residue standpoint.

Mr. KLEINFELD. You were interested in the residue problem.

Dr. ESTY. Definitely.

Mr. KLEINFELD. And that is one reason why you went to the university authorities; is that not correct?

Dr. ESTY. I tried to make it clear that they were the ones that have been setting up the recommendations for use. It was our responsibility to see to what extent these materials were carried over into the finished product.

Mr. KLEINFELD. Do the canners permit any residues on their baby foods?

Dr. ESTY. Yes.

Mr. KLEINFELD. What residues—of what insecticides?

Dr. ESTY. It would be impossible to get raw materials free from insecticides.

Mr. KLEINFELD. Which insecticides would be present in small quantities?

Dr. ESTY. Methoxychlor might be there in small quantities.

Mr. KLEINFELD. DDT?

Dr. ESTY. Very little.

Mr. KLEINFELD. Some?

Dr. ESTY. Maybe a trace.

Mr. KLEINFELD. Are the standards of the canners different with respect to regular canned foods for adults than with respect to canned foods for babies?

Dr. ESTY. The canning industry is trying to eliminate all residues, and they are doing it. For babies they naturally would want to have as pure a product as possible, but they want to have the same degree of purity as far as it is possible to get it in all canned products for any use.

Mr. KLEINFELD. Are you saying that the standards for both canned foods for adults and canned foods for babies are exactly the same?

Dr. ESTY. Up to the present time I believe they are.

Mr. KLEINFELD. They do not take, then, extra additional precautions with baby food?

Dr. ESTY. I don't think so.

Mr. KLEINFELD. Have you had any experience with insecticides which have a penetrating quality, which penetrate into the fruit or vegetable?

Dr. ESTY. It depends on what extent you mean by the penetration. DDT is on the skin of tomatoes.

Mr. KLEINFELD. Of course, you know a lot more about it than I do. I am talking about some insecticides the residue of which does not remain on the surface, but actually penetrates into the fruit or vegetable. Do you know of any such?

Dr. ESTY. I don't recall them.

Mr. KLEINFELD. No such insecticides have come to your attention?

Dr. ESTY. If you know of one, I will try to answer it.

Mr. KLEINFELD. I am asking you, sir.

Dr. ESTY. I don't recall.

Mr. MCDONOUGH. Is there not some penetration of the insecticides used in the apricot that goes beyond the skin into the fruit?

Dr. ESTY. On the surface. But in the case of apricots, if they are peeled with lye, the residue would be removed.

Mr. MCDONOUGH. Is that so? It does not get into the fruit immediately?

Dr. ESTY. It is on the surface.

Mr. MCDONOUGH. All on the surface?

Dr. ESTY. Yes.

Mr. MCDONOUGH. What about the accumulation of insecticides in artichokes, cabbages—can that be washed off? Does that penetrate into the vegetable or is it just a surface coating?

Dr. ESTY. It is my understanding that it is a surface contamination.

Mr. MCDONOUGH. Celery also?

Dr. ESTY. I think so.

Mr. MCDONOUGH. There was someone this morning who testified to the effect that some insecticide got into the vegetables. I have forgotten who it was.

Mr. KLEINFELD. It was my understanding that was the case, but apparently it does not exist according to Dr. Esty.

Dr. Esty, you know that we asked a number of canners on the west coast to send representatives here to testify as to the problems which

they had encountered, and the committee agreed that you would represent all the canners; is that correct?

Dr. ESTY. That is correct.

Mr. KLEINFELD. Your testimony represents all the information which you obtained from the canners here?

Dr. ESTY. This has been submitted to the industry and this is their statement, sir.

Mr. KLEINFELD. Do you know what the situation is on residues as far as the frozen-food people are concerned?

Dr. ESTY. Similar to the statement here. It has been reviewed by them.

Mr. KLEINFELD. Is the situation as far as they are concerned any better or worse than with respect to the canners?

Dr. ESTY. It seems to me they would be very similar.

Mr. KLEINFELD. What is the translocation of insecticides?

Dr. ESTY. I don't know.

Dr. HEDRICK. Doctor, what is the method the canners use in preparing food for canning, that is, in getting rid of residue—the washings, kind of wash. How many different washes do they use?

Dr. ESTY. It depends on the product.

Dr. HEDRICK. Suppose they are getting spinach ready to can, how would they treat it to get all the residue off it?

Dr. ESTY. Spinach would come in in crates that would be dumped on a belt that would go through two or more washes, and then go into a blancher, and then out, and inspected and put into cans.

Dr. HEDRICK. Do you use any chemicals in the water, or just plain water?

Dr. ESTY. Plain water.

Dr. HEDRICK. I believe up in Washington we found out that they used one-half percent hydrochloric acid in wash for apples.

Dr. ESTY. That is right.

Mr. HEDRICK. Why would they do that?

Dr. ESTY. To remove the lead arsenate residue.

Dr. HEDRICK. Would not plain water remove it?

Dr. ESTY. No, sir.

Dr. HEDRICK. If they run through enough washes, would it?

Dr. ESTY. Not with water.

Dr. HEDRICK. How are other foods prepared? How are they washed?

Dr. ESTY. Tomatoes come in lug boxes and are dumped into a tank, and then they get a good spray wash with water, and then are inspected, either peeled or put into a grinder, and they are made into products.

Dr. HEDRICK. How much water would have to be used and how often is that water changed?

Dr. ESTY. As often as is necessary.

Dr. HEDRICK. About how often would that be?

Dr. ESTY. In the case of tomatoes, the dump tanks might be used during a shift of 8 hours. But after that, they go out onto a belt where they are washed with fresh water so that before it goes to the grinder, they are well washed with fresh water.

Dr. HEDRICK. It seems to me if you used water for 8 hours, it would be pretty well contaminated by that time.

Dr. ESTY. It gets dirty.

Dr. HEDRICK. I think so.

Any other questions?

Mr. KLEINFELD. One last question. Is it not a fact, Dr. Esty, that toxic materials are being used today on food crops and that we have no practical means of analyzing some of them?

Dr. ESTY. There are materials for which we do not have reliable methods.

Mr. KLEINFELD. That is all. No further questions.

Mr. HORAN. Could you tell me the procedure of inspection service that you have around the canneries here in the West?

Dr. ESTY. You mean the State cannery act?

Mr. HORAN. Well, the entire inspection that you are subjected to, both the Federal-State inspection and the pure food inspection. They inspect you, do they not?

Dr. ESTY. The Federal Food and Drug Administration has inspectors throughout the country, and they go into a plant during the canning season to the extent that they may feel that some problems might arise, keep a check on the operations. They are not in every plant every season.

Mr. HORAN. But they come and go at random?

Dr. ESTY. That is right.

Mr. HORAN. You do have Government inspection, though, on the premises, do you not?

Dr. ESTY. Federal inspection?

Mr. HORAN. Well, inpectors.

Dr. ESTY. In the case of tomatoes, they have in this State an inspection for grading the fruit. It is a matter of taking samples from each delivery and grading them up. But that has nothing to do with the Food and Drug Administration, either State or Federal.

Mr. HORAN. Now, of course, your baby foods meet the requirements of the Food and Drug Act, do they not?

Dr. ESTY. That is right.

Mr. HORAN. Are they even close to the tolerance allowed for that purpose by the Food and Drug Administration?

Dr. ESTY. They are not.

Mr. HORAN. Are they well under it?

Dr. ESTY. Very well under it.

Mr. HORAN. How do you run your tests so that you know that you comply with the Food and Drug Act?

Dr. ESTY. How do we analyze the product?

Mr. HORAN. Yes.

Dr. ESTY. The canners themselves have their own control departments, and they have field men going out who know what has gone on to the crops. They make tests on the raw materials before, and as they come into the plant for use. They also make tests on the finished product, using the procedures that have been developed by the Food and Drug Administration and used by other groups.

It is the responsibility of each baby food manufacturer to see to it that his product meets the Federal requirements.

Mr. HORAN. And if he doesn't, his product is seized.

Dr. ESTY. Correct.

Mr. HORAN. In shipment.

Dr. ESTY. Right.

Mr HORAN. That is all, Mr. Chairman.

Dr. HEDRICK. Mr. Kleinfeld, it seems to me way back last year Dr. Dunbar appeared before this committee on the Food and Drug Act, and at that time there were some oranges sprayed down in Florida with some kind of a chemical that made rats sick and babies fed this orange juice got sick. What was that?

Mr. KLEINFELD. The substance was thiourea, but the people who were thinking of applying it to the oranges, I think, came in and checked with the Food and Drug Administration before they used it on the oranges. The Food and Drug Adminstration experimented with it, and the juice of the oranges containing thiourea did kill rats.

Dr. HEDRICK. In other words, penetrated the orange peel?

Mr. KLEINFELD. Right.

Dr. HEDRICK. Enough to make babies sick.

Have you had any experience like that, Doctor?

Dr. ESTY. No, sir. It is common experience in our industry where there is a new problem or a new material to confer with the Food and Drug Administration and not to proceed if there is any problem until the problem is solved. The industry is very cooperative and gets advice from Federal and State agencies.

Dr. HEDRICK. What I was getting at—this actually penetrated the peel of the orange and got into the orange juice.

Mr. ESTY. Yes.

Dr. HEDRICK. Do you think that is possible?

Dr. ESTY. Evidently it did in that case.

Dr. HEDRICK. It did in this case evidently.

Dr. ESTY. Yes.

Dr. HEDRICK. I believe you stated a while ago you did not think that could happen.

Dr. ESTY. At the time I did not know that.

Dr. HEDRICK. Any other questions?

Thank you very much, Doctor.

Dr. ESTY. You are welcome.

Dr. HEDRICK. Who is your next witness?

Mr. KLEINFELD. Mr. Armitage.

(The oath was administered by the chairman.)

Mr. KLEINFELD. Would you read your statement, please.

TESTIMONY OF H. M. ARMITAGE, CHIEF, BUREAU OF ENTOMOLOGY, STATE DEPARTMENT OF AGRICULTURE, SACRAMENTO, CALIF.

Mr. ARMITAGE. My name is H. M. Armitage. I hold the position of chief of the bureau of entomology, State department of agriculture, with headquarters in Sancramento, Calif. I have had 43 years' experience in agriculture in California, starting with inspector in the field. All of the service I have had has been associated directly or indirectly with insect pest control.

Dr. HEDRICK. You must have started mighty young, Doctor.

Mr. ARMITAGE. I did, at 18. Thank you for the title, which I have not earned. Unfortunately, I have not had the advantage of a formal college training, but have had to pick up as I went along.

I have held the present position since 1949. Prior to that I held the position of chief of the combined bureau of entomology and plant quarantine from 1944 to 1949. From 1931 to 1944 I was in charge of plant quarantine enforcement at the port of San Francisco as associate chief of the bureau of plant quarantine, engaged in the enforcement of both Federal and State plant quarantines designed to prevent the introduction of new plant pests from foreign countries. From 1923 to 1931 I served as entomologist and deputy agricultural commissioner in Los Angeles County in the mass production and timed liberation of beneficial insects in the control of a mealybug occurring as a major pest of citrus in southern California, for which mealybug no satisfactory chemical method of control was available. From 1918 to 1923 I was employed as assistant superintendent of the State insectary and entomologist with the University of California investigating the biological control of various species of mealybugs as pests of citrus. From 1915 to 1918 I served as agricultural commissioner of the county of San Diego responsible for the local enforcement of Federal, State, and county plant quarantine regulations and enforcement of legal insect pest abatement procedures with respect to agricultural pests. From 1913 to 1915 I was employed as agricultural inspector in the county of San Diego performing orchard and field inspections to determine the presence of and degree of infestation with respect to plant pests and in making recommendations as to their control. From 1908 to 1913 I was employed in private industry in field pest control, particularly concerned with the cyanide fumigation of citrus trees in southern California.

I am a member of the American Association for the Advancement of Science, the American Association of Economic Entomologists—past chairman of the Pacific Slope Branch representing the 11 Western States, Hawaii, Mexico, and western Canada, 1949—the California Academy of Sciences, the Pacific Coast Entomological Society—past president, 1937—Northern California Entomological Club—past president, 1946—and the Southern California Entomological Club.

The 43 years' service in agriculture in California as outlined has given me a rather broad insight into the various problems concerned with the control of plant pests and the use of and hazards present in the chemicals used for that purpose. None of this service has been in research. The activities of the State and county departments of agriculture in California by which I have been employed are regulatory and service, research being considered a function of the university. The duties in the bureau of entomology in the department of agriculture include informational assistance to county agricultural commissioners in meeting local pest control problems: directed survey for the presence of new insect pests within the State; eradication of incipient infestations of such new pests when found; and Statewide control of major pests not amenable to individual grower effort.

In view of my experience as outlined and my present responsibilities as chief of the bureau of entomology, I fully appreciate the opportunity of appearing before your select committee for the purpose of commenting on (*a*) the necessity of use of pesticides as used in the protection of agricultural crops in California, and (*b*) the need for and nature of adequate provisions that obviously should be provided to assure their safe use with respect to man and livestock. Both of these mat-

ters are of particularly vital concern to the agricultural industry of California and no less so to that of the Nation.

They are of particular concern to California for the reason that agriculture is a basic industry in the State. The annual returns from agricultural crops in California has in recent years approached one and a half billion dollars. This income is derived from the production and the shipping or processing of over 200 separate crops.

From one-fifth to one-sixth of the fruits and vegetables—both fresh and processed—required to feed the Nation are produced in California. Several important crops from the national standpoint such as lemons, almonds, dates, and figs are substantially restricted to production in this country only in this State. Obviously an industry of this importance in the life of the State and the Nation merits every possible protection. Prevention of avoidable loss from insect pest attack is a major part of that protection.

Ranging in altitude from 250 feet below sea level to 14,000 feet above, California lends itself to almost every form of agriculture profitably engaged in by man. It is approximately 1,000 miles from the extensive early-season vegetable producing areas in Imperial County in the southeastern part of the State to the coastal plantings in Del Norte County in the northwestern corner, with practically every type of climate and soil required in agricultural practices found somewhere between these two extremes.

Mr. McDonough. Where is the greatest diversification of crops—in what part of the State?

Mr. Armitage. In what part of the State?

Mr. McDonough. Yes.

Mr. Armitage. The honor might lie between the Imperial Valley or Southeastern Desert area and the Sacramento-San Joaquin Valleys.

Mr. McDonough. Between those?

Mr. Armitage. In one or the other. There is nothing but mountains in between. They are two separate areas. Surprisingly, in view of the large number of different agricultural crops grown commercially in the State, the areas of agricultural land available in the great central, coastal and southern semiarid valleys have permitted the contiguous planting of thousands of acres of such crops as apples, peaches, pears, grapes, oranges, nuts, berries, melons, tomatoes, spinach, and many others, each restricted to the area or areas within the State to which it has been found best adapted.

I mention these large contiguous plantings of a single host for the reason that they are not only conducive to the survival of insect pests but encourage their increase to economic numbers in the absence of effective control measures, thus greatly magnifying the pest-control problem. Under these conditions many common insect species such as aphis, thrips, and spider mites move over onto commercial crops from native weeds and have found it possible to increase to such numbers as to become major pests. Other species of insects having no recorded economic importance have been inadvertently introduced into such favorable habitats, in spite of the intensive plant quarantine restrictions established and aggressively enforced, and have become major crop pests.

Insects are just as responsive to a favorable climate as is man. They have the added advantage of short life cycles with high repro-

ductive capacity which insures survival under the most adverse conditions and permits them to increase to epidemic numbers under the favorable host conditions provided by man. A prominent entomologist is authority for the comment that were it not for the ingenuity of man in providing control, this would be an age of insects. This holds true in agriculture. At that, out of the several hundred thousand insect species recorded, relatively few ever attain the status of major insect pests. However, these few unless held under control, can be responsible for tremendous losses to growers.

We have one very interesting insect in California, the larvae of which spend their entire cycle in pools of crude oil in Southern California. They live in crude oil much the same as the mosquito. The eggs are laid on the margin of the pool and even with the high temperatures they survive under those adverse conditions. Yet oil is one of our standard insecticides.

Mr. McDONOUGH. Do they get into the food products at all?

Mr. ARMITAGE. No; I don't think they affect food crops. I merely cited them to show their versatility.

Losses from insects may take place in any one or all of several ways. They may result from the destruction of the following season's fruit buds or spurs caused by a heavy infestation with aphis; from functional disturbance of the plant's growth through the removal of plant juices by sucking insects such as leafhoppers and spider mites; from scarring of fruits by the feeding of thrips; from infestation of fruit by larvae of such insects as the apple codling moth or peach twig borer; from complete defoliation of plants and exposure of fruit to sunburn due to foliage feeders such as grasshoppers; from plant loss due to disease as transmitted by leafhoppers, in the case of western yellow blight of tomatoes or curly top of melons, beans, and spinach; or merely from reduction in grade due to the presence of surface pests such as scale insects or surface scarring by thrips, plant bugs, or weevils. A drop in one grade, alone, under present economic conditions, may mean the difference between profit and loss to the grower.

Standards set by the Food and Drug Administration in protecting the consumer against posible insect contamination in processed foods make it mandatory that growers, processors, and handlers use every possible means of preventing prior infestation to the extent of using the most effective and most economical and the safest chemical obtainable. Residue tolerances with respect to such chemicals as used, already established or contemplated, require the same consideration. Our own standards of quality as regards both fresh and processed fruits and vegetables make it further mandatory that insect infestation be held at an absolute minimum in the interest of profitable production by the grower.

I might point out that California growers have been unusually insect pest conscious since agriculture became important within the State in the early eighties.

Mr. McDONOUGH. Is California subject to any insect plague like we find in the Middle West—the grasshopper plague and the locust plague?

Mr. ARMITAGE. We have some 65 species of grasshoppers in California, of which 12 cause economic damage, but none is of the true migratory type.

We have some insects, because of wide distribution over the State, that are not amenable to control by individuals. For that reason, the State does engage in their control. Grasshoppers are one of those, beetlehoppers another. I might refer to those a little later.

Mr. McDONOUGH. Nothing of a cyclic nature?

Mr. ARMITAGE. We do not have anything of a cyclic nature, except they are all on a continuous repeated cycle.

Dr. HEDRICK. Do you have the Japanese bettle in California?

Mr. ARMITAGE. No, but we did take one in a trap this summer located in the approach area to the airport at Los Angeles. We immediately treated all soil within a radius of 300 feet, which is in conformity with the Federal program where Japanese beetles are found.

Mr. McDONOUGH. What effect, if any, and what variety of insects are we subject to infestation from Mexico?

Mr. ARMITAGE. The Mexican fruitfly for one and also the citrus blackfly which is causing considerable concern at the present time.

Mr. HORAN. What is that Hawaiian pest now?

Mr. ARMITAGE. The Oriental fruitfly?

Mr. McDONOUGH. The Mediterranean fruitfly.

Mr. ARMITAGE. Neither occur on the North American Continent.

Mr. HORAN. They found one bug on one airplane a year before last, did they not?

Mr. ARMITAGE. Oriental fruitfly?

Mr. HORAN. Yes, sir.

Mr. ARMITAGE. Not to my knowledge. The Oriental fruitfly has been taken in the larvae stage, principally in ship stores. I don't believe an adult fly has ever been found on a plane on arrival here, for the reason that planes are subject to disinfection before departure from the Islands. They get an aerosol treatment with DDT and pyrethrin before the passengers emplane and another after they are on board. That would eliminate the possibility of an adult fly being carried. But occasionally larvae are found in ship stores or in fruit in passenger baggage.

Mr. McDONOUGH. Is there much infestation from Mexico that you mentioned?

Mr. ARMITAGE. None of those mentioned have found their way here yet. I might point out that California is peculiarly protected by natural barriers against the natural spread of insect pests in that it is surrounded by water on the west, high mountains on the north, east, and south, plus additional wide desert areas in the southeast. There are only 18 points of entry through those mountains, which are controllable for inspection of material that might be carried by private automobile.

There are only three major maritime ports of entry and five smaller ones. So it is entirely practicable to attempt to control the movement of all those fresh fruits and vegetables that might introduce pests. Most of the pests that occur in Mexico and spread, naturally do so northward and east from the Southwest desert in the direction of the prevailing winds. They spread north and east through the central United States and seldom, if ever, does one find its way westward. The prevailing wind currents are not in that direction.

Mr. HORAN. Are you aware we have had for a considerable time a mission in Mexico City fighting the citrus black fly down there?

Mr. ARMITAGE. That is right.

Mr. HORAN. Under the leadership of Dr. Baker. It has spread to the Gulf of Mexico on the west side, but that is about three or four hundred miles below the border.

Mr. ARMITAGE. That is right.

Dr. HEDRICK. I remember several years ago in driving from Oregon into your State they held me up here on the road and thoroughly inspected my car because I had an ear of corn. They examined me from every angle, gave me the "works," and questioned me. I had to tell them exactly where I got it and all about it. It looked as though I would not get in.

Mr. ARMITAGE. They would let you in and turn the corn back. They were interested in the European corn borer, which does not occur here and is just now gradually spreading west of the Mississippi. I take it that the corn had originated in the Middle West?

Dr. HEDRICK. I think I bought it in Kansas probably.

Mr. ARMITAGE. It might or might not have presented a hazard. We are not able to identify corn as to origin and if it comes from east of the mountains, it is assumed to be a potential carrier. It is for such reasons you are intercepted at these border stations. Because we have these geographical barriers and controllable avenues of entry such a procedure has been found practical in preventing the introduction of new pests.

You might say the airplane has eliminated that protection. It has, to a limited degree, but your baggage limitation is so small on planes that inspection has shown passengers do not carry more fruit or more carriers of pests than are within an expected margin of error within this type of enforcement, and it does not pay to check them. We do know that one introduction does not establish a pest; that it takes many thousands, sometimes.

Dr. HEDRICK. How about coming in on the train?

Mr. ARMITAGE. The same thing is true. We rode trains at all points, coming in from outside of the State, for 3 years and determined the hazard was still within the margin of error present in any quarantine-enforcement program.

Mr. MCDONOUGH. How does that control in California compare with other States in the Union? Does any other State take that precaution?

Mr. ARMITAGE. With respect to border quarantine inspection, Arizona, I believe, is the only other State that does maintain such stations. Oregon has maintained cherry fruitfly stations within their State. The Federal Government maintains seasonal Japanese beetle road blocks throughout the infested areas of the eastern United States. Florida does not maintain road blocks, but has a very intensive quarantine inspection service. I think California for reasons previously stated is the only State that maintains a comprehensive port and border service of that type with adequate personnel to enforce it.

Efforts to prevent the further introduction of major pests were initiated with the finding of grape phylloxera and codling moth within the State. Surrounded by high mountains, broad deserts, and an extended coast line these natural factors have served as effective bar-

riers against natural spread of insect pests into the State. The few accessible avenues of entry through those barriers to man-made traffic could be controlled, making possible the enforcement of effective plant quarantine restrictions in preventing pest introductions through such means. Later, directed survey for the possible presence of major pests which had escaped such safeguards, has been conducted with the intention of carrying out the eradication of incipient infestations wherever practical. This latter action has resulted in the carrying out of several major insect eradication control projects which have involved the use of tremendous volumes of insecticides, at the State level. These materials, however, have all been selected with a view to safety as far as use and residual hazards are concerned.

For instance, since 1945, we have been trying to eradicate a serious pest of grapes in San Diego County. Grapes are not a commercial crop in that particular area, but we have about 50,000 acres to the north and have 500,000 in San Joaquin Valley, and if a pest of that kind should be accepted as established, we would expect a natural spread within the State and infestation to all the areas which it found had climatic conditions adaptable. I cover that here. Since 1945 a concerted attempt has been made to eradicate the western grape skeletonizer in San Diego County. As part of the measures used all cultivated grapes in the eradication area covering several hundred square miles and involving 2,000 acres of commercial vineyards and over 9,000 yard plantings, have been kept covered with an insecticidal dust from the time the first leaves appeared in the spring until the last leaves dropped in the fall. Sodium fluoaluminate, using 25 pounds of a 50 percent dust per acre, was selected for this purpose. In the amount used there has been no residual hazard to consumers. At the same time any residue was easily removed from harvested grapes by washing in water, where desirable.

Since 1946 all beans growing within a 1-mile radius of any planting infested with Mexican bean beetle in Ventura County, have been similarly dusted with 1 percent rotenone as part of the measures being employed in the eradication of that pest. At the peak of these operations 7,500 acres of beans in an area of 60,000 acres were under treatment. A dust containing 1 percent rotenone was used for this purpose as it was not only the most effective chemical known but lost any residual toxicity which it might have, before the harvested crop entered consumer channels.

Methoxychlor has been found effective and is being used in the attempt to eradicate cherry fruitfly in Siskiyou County. No fruit is allowed to mature within the eradication area and residue is not a problem.

In control operations directed against the beet leaf hopper along the western side of the San Joaquin Valley several hundred thousand gallons of DDT in oil have been used annually in spraying over 150,000 acres of range weeds in selected areas where these leafhoppers overwinter. This species of leafhopper is the only known transmitting agent of curly top virus which has caused heavy losses in tomatoes, melons, beans, flax, sugar beets, and other susceptible hosts. The amount of actual DDT used per acre is restricted to 1 pound, which is far below the amount toxic to sheep, the only livestock that might feed on treated plants in this area. Over one-third of a million dol-

lars has been expended annually for the last 2 years in carrying out this program.

These insect pest eradication-control programs as conducted by the State involve over-all expenditures of approximately three-quarters of a million dollars annually and are cited merely to emphasize the importance attached to insect pest control in California.

The foregoing has been presented in support of the necessity of use of pesticides in the profitable production of agricultural crops in California. That they may be used only with a due regard to the safety of the consumer, whether man or animal, goes without question, and adequate safeguards are always carefully observed.

Literally there is no such thing as a nontoxic pesticide. Any chemical that is toxic to insects is, with few if any exceptions, also toxic to man and to livestock. However, the degree of toxicity is in direct ratio to the amount or concentration of the pesticide to which each is exposed. Toxicity is usually based on the number of grams of the pesticide used per kilogram body weight of the test animal resulting in mortality. Obviously the amount required to control an insect on that basis would be infinitesimal as compared with the amount that would be equally toxic to man or livestock. This, of course, may hold true only for acute toxicity. The insect pest may be killed by contact with or ingestion of minute quantities of a chemical which would not affect man or livestock in that amount. However, it is recognized that the latter might be more or less seriously subject to chronic toxicity due to continued exposure to or consumption of commodities so treated with such minute quantities. DDT is an excellent example of such an insecticide. Both the acute and chronic toxicity of any chemical should, of course, be known and carefully considered before it is permitted to be used on agricultural crops.

In evaluating such materials there are two criteria that might be observed. The first concerns the use of a material in which the hazards of use are completely lost before the commodity concerned leaves the hands of the operator carrying out the treatment. I have in mind the use of cyanide. This chemical has been extensively used for half a century in California as a fumigant in the treatment of fruits and vegetables in the control of insect pests both before and after harvest and with regard to both fresh and processed products. There can be no question but that cyanide, if improperly handled, is one of the most deadly chemicals that can be used in insect pest control, I regret to say that many workers have been killed due to its careless handling. However, once the treatment has been completed and the commodity concerned properly aerated before release, there is no hazard to the consumer nor has any consumer, to my knowledge, ever been affected in any way by its use.

The second situation concerns the use of a pesticide in which the hazard to man and animal continues to be present for several days after the treatment has been completed. Parathion is an excellent example of such a material in which the chemical may continue to represent a hazard for some time after the treatment has been applied. However, the hazards presented in using chemicals having a residual toxicity as pesticides on agricultural products can be avoided by observing proper precautions. In general, they should not and are not applied to any agricultural food crop excepting sufficiently in

advance of harvest to prevent any hazardous residue at harvest. In other instances use is permitted when means of removal to a point below any tolerance allowed, are available and followed.

California growers and regulatory officials have long been aware of the hazards to man and livestock present in the use of chemicals in pest control on agricultural products, which might have a prolonged residual effect. As has been or will be testified by those responsible in such matters all pesticides must be registered or licensed before they may be legally sold within the State. Before registration for sale is accepted, the manufacturer must not only show that the material will control the pests for which it is recommended, but must also provide information as to its acute and chronic toxicity with respect to warm-blooded animals. This information must show that such toxicity in the amounts and manner of use recommended is harmless to man and warm-blooded animals or otherwise specifically outline the conditions under which it may be safely used. Such information must be acceptable to the registering official.

Further, the director of agriculture has officially declared some of the newer insecticides, such as parathion, EPN—(ethyl-para-nitrophenyl-thionobenzene-phosphorate)—and TEPP—(tetraethyl-pyrophosphate)—and also the common arsenicals when applied as dusts by machine-powered equipment, as hazardous under certain conditions and their use restricted to permit.

Certainly, where agriculture is such an important source of State income, the director is not going to approve for sale any pesticide, the use of which might jeopardize its outlets for such products. It would be reasonable to believe that any established manufacturer of pesticides would jeopardize his standing by failing to fully meet these requirements.

The manufacture of the newer insecticides as represented in chlorinated hydrocarbons and phosphates is so complicated technically and the competition so keen that those engaged in this business have provided information concerning the toxicity of their product before even permitting its experimental use.

With the United States Department of Agriculture and the State departments of agriculture regulating pesticides through registration before they can be offered for sale and the universities acting as observers in their experimental and commercial applications, and the manufacturer extending every effort to determine and accurately report the acute and chronic toxicity of his product before offering it for registration for sale, the situation would seem to be fully safeguarded. Withholding use of such materials until tolerances might be established after prolonged tests by another official agency would seem unnecessary and would certainly stifle much needed progress in this field. However, such an agency might properly establish a tentative tolerance with respect to the use of such materials on food crops and after observation and tests modify such tolerance as the facts justify.

Briefly summarizing the foregoing comments:

(1) Agriculture is a basic industry in California.

(2) The volume of fruits and vegetables grown provides one-fifth to one-sixth of that required to feed the Nation.

(3) It involves the production and the shipment or processing of over 200 types of agricultural products.

(4) Each of these products is subject to attack, either during the period of growth or during dry storage, by one or more insect pests.

(5). In the absence of effective control measures losses from such attack could make this industry unprofitable and seriously curtail the volume necessary for national needs.

(6) A wide range of effective and economical pesticides are required for the control of these pests.

(7) The hazards to man and livestock in the use of some pesticides is recognized and suitable precautions taken.

(8) The United States and the California Departments of Agriculture restrict the sale of pesticides to those registered.

(9) Registration requires that acceptable information as to the acute and chronic toxicity of pesticides to man and livestock be furnished by the manufacturer so proper label precautions can be drawn.

(10) In California the State director of agriculture has further declared parathion, EPN, TEPP, and common arsenicals when dusted by machine-powered equipment as hazardous under certain conditions and their use restricted to permit. This problem can only be handled by local regulation.

(11) In view of present safeguards it seems unnecessary to make further Federal legal restrictions and the present method of establishing spray residue should be streamlined.

(12) It is recommended that responsibility for the determination of use of pesticides in the control of insects remain the duty of the United States Department of Agriculture, that responsibility for determination of toxicity to man and animals in connection with the use of pesticides be given to the United States Public Health Service, and that the United States Food and Drug Administration continue as the enforcement agency for spray residue on produce.

Dr. HEDRICK. Any questions?

Mr. JONES. No questions.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. No questions.

Dr. HEDRICK. Mr. Kleinfeld?

Mr. KLEINFELD. No questions.

Dr. HEDRICK. Thank you very much, sir.

Mr. ARMITAGE. Thank you.

Dr. HEDRICK. Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. E. M. Mrak.

(The oath was administered by the chairman.)

TESTIMONY OF E. M. MRAK, PH. D., CHAIRMAN, DIVISION OF FOOD TECHNOLOGY, UNIVERSITY OF CALIFORNIA, BERKELEY, CALIF.

Mr. KLEINFELD. What position do you hold?

Dr. MRAK. I am chairman of the division of food technology, University of California.

Mr. KLEINFELD. What is your background?

Dr. MRAK. I have the B. S., M. S., and Ph. D. degrees, all obtained at the University of California.

Mr. KLEINFELD. And you have been engaged in the field of food technology for how many years?

Dr. MRAK. Since about 1926.

Mr. KLEINFELD. Please read your statement.

Dr. MRAK. As a food technologist, I have been interested in the effect of the use of chemicals in the production of food products, the effect of the use of pesticides and insecticides with respect to food products, and the use of chemicals in the manufacture of fertilizer, for some time. This interest, however, has been primarily from the standpoint of teaching and not research. Only since last summer have some of my colleagues become involved in research relating to the effect of insecticide residues on acceptability of the processed product. This work has thus far been limited to three canned items. Before going into this in more detail, however, it may be well to indicate briefly the activities of the division of food technology at the University of California at Berkeley and Davis.

Through the years, this division has concerned itself with teaching, extension, and research activities relating almost entirely to fruit and vegetable products produced in California. In general, emphasis has been on the improvement of the quality of products produced by dehydration, canning, freezing, fermentation, et cetera, and the utilization of surplus fruits and vegetables grown in California. In formulating our research programs it has been necessary to consider processed foods from the standpoint of the consumer. In other words, it has been necessary to consider factors that influence acceptability, utility, stability, nutritive value, and, of course, safety to the consumer. Consumer acceptability is very complicated and is related to flavor, texture, appearance, and many other factors. The consumer is interested in the ease with which products may be prepared; in other words, utility. Stability is important from the standpoint of the consumer as well as the producer. An unstable product may well deteriorate in flavor, texture, appearance, and nutritive value. Such changes usually decrease the acceptability of a product and may adversely affect its utility. These deteriorative changes may occur while the food is in storage in warehouses, on grocers' shelves, or most important of all, while stored in the home.

In many instances chemicals play a very important role in enabling the food processor to meet consumer preferences with respect to acceptability, utility, and stability. Dr. John Matchett, in his report to this committee, listed a number of chemicals that are used, with approval of the Food and Drug Administration, to improve foods from the consumers' as well as producers' point of view. The use of these chemicals is important and has resulted, in most cases, from a great deal of research. If they were not used, we would not be favored with so many highly acceptable foods today. Furthermore, storage losses during distribution, and particularly in the home, would be much greater. It would be unfortunate to stop or even greatly delay advances that would result in more acceptable, stable, and nutritious foods through the use of chemicals that are harmless to the consumer. The important question is, How can we continue to apply the results of researches on the use of chemicals and at the same time be certain that the consumer is protected? The answer to this question will undoubtedly come out of the deliberations of this committee. A board such as suggested by Dr. Ivy to this committee sounds logical to me. On the other hand, as Dr. Roy Newton indicated to this committee, the food producer and processor should be protected against arbitrary rulings which may be unscientific and unsound from the practical standpoint and against public interest.

In reading through many of the reports to this committee, one is impressed with the extent of the feeling that responsibility for use of chemicals in foods should be entirely on the food processor. If this view is to be imposed, it will undoubtedly retard application of certain advances resulting from research on the processing of foods. Screening and testing is a slow and laborious process and certainly would be as difficult for the processor as for the Food and Drug Administration. Here again, some such organization as suggested by Dr. Ivy might be the answer to the problem.

It is encouraging to know that the canning industry is active in developing a program to determine which pesticides and insecticides influence the acceptance qualities of certain canned products. An industry committee composed of technical representatives from all branches of the fruit and vegetable canning industry has proposed that a cooperative program of research be conducted by the divisions of entomology and food technology of the University of California with technical assistance to be provided by the canning industry. This program, which was started this summer, involves the treatment of crops with selected pesticides by the division of entomology followed by processing and acceptance testing by the division of food technology. Only pesticides in the final stages of testing and prior to recommendation for use by growers were tested this year.

Prof. George L. Marsh initiated our part of the program by canning strained pears in cooperation with the canning industry that had been sprayed in the orchard with ovatran, aramite, R–242, and 923 genite, and tomato juice from tomatoes that had been treated with aldrin, dieldrin, DDD, heptachlor, and Q–137. I am not familiar with these various pesticides, but it is my understanding that they are all miticides. The canned products are in storage now and will be examined periodically during the next 10 to 12 months by Dr. Elly Hinreiner, of our division. Canned orange juice will also be examined, although it was not processed under our supervision. I might add that this was canned in the South.

Residue analyses on the fresh product are being made by another agency. I think Dr. Hoskins is doing this.

Such a program enables correlation of spray programs and processing and storage, with flavor evaluation of the final product—an essential step in an over-all program.

Dr. HEDRICK. Any questions, Mr. Horan?

Mr. HORAN. No.

Dr. HEDRICK. Mr. Jones?

Mr. JONES. I don't believe I have.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. These tests you referred to that are under consideration at the present time, were they vegetables and fruits that were treated with these various chemicals and thoroughly washed?

Dr. MRAK. By standard canning procedure—washed thoroughly and canned. That is right.

Mr. MCDONOUGH. In other words, you did not use all of the various pesticides on the same fruits, but different pesticides on different fruits?

Dr. MRAK. That is right.

Mr. MCDONOUGH. And checking for the residues?

Dr. MRAK. That is right.

Dr. HEDRICK. Doctor, in buying one of those big half-gallon cans of orange juice, 39 cents, how much actual orange juice is in that mixture?

Dr. MRAK. According to the Food and Drug Administration, if it says all orange juice, it should be.

Dr. HEDRICK. Does it say on the can? I wondered.

Dr. MRAK. I think it should be all orange juice. I don't think any reputable packer would do otherwise.

Dr. HEDRICK. You do not mean to say it is pure orange juice you buy in these cans?

Dr. MRAK. If it says pure orange juice, I would believe it.

Mr. JONES. Most do not say pure orange juice. They may say sugar added, or orange juice and grapefruit juice.

Dr. HEDRICK. I have been told there is about 21 percent orange juice in it. I don't know whether that is correct or not.

Dr. MRAK. If it isn't on the label, I would be disinclined to believe it.

Dr. HEDRICK. Any other questions, Mr. Kleinfeld?

Mr. KLEINFELD. No.

Dr. HEDRICK. Thank you, Doctor.

The committee will stand adjourned until tomorrow at 9:30.

(Whereupon, at 5:35 p. m., the committee adjourned, to reconvene in the same room at 9:30 a. m. Wednesday, November 21, 1951.

CHEMICALS IN FOODS AND COSMETICS

WEDNESDAY, NOVEMBER 21, 1951

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE TO INVESTIGATE THE
USE OF CHEMICALS IN FOODS AND COSMETICS,
San Francisco, Calif.

The select committee met (pursuant to H. Res. 74 and H. Res. 447, 82d Cong., 1st sess.; continuing the investigation and study begun under authority of H. Res. 323, 81st Cong., 2d sess.), at 9:30 a. m., in room 309, Federal Building, San Francisco, Hon. Paul C. Jones presiding.

Present: Representatives Jones of Missouri, Hedrick of West Virginia, Miller of Nebraska, McDonough of California, and Horan of Washington.

Also present: Vincent A. Kleinfeld, chief counsel; and Alvin L. Gottlieb, associate counsel.

Mr. JONES. The committee will be in order.

I should mention that Dr. Hedrick, who is acting chairman of the committee, will be here a little later.

Who is your first witness, Mr. Kleinfeld?

Mr. KLEINFELD. Is Mr. Willat here?

Mr. WILLAT. Yes.

Mr. KLEINFELD. Will you take the stand?

(The oath was administered by the chairman.)

TESTIMONY OF A. F. WILLAT, REPRESENTING HEATLESS PERMANENT WAVE CO., AND WILLAT PRODUCTION CO., SAN FRANCISO, CALIF.

Mr. KLEINFELD. Mr. Willat, what position do you hold?

Mr. WILLAT. I am president of the Willat Production Co., 1122 Folsom Street, San Francisco; also engineer.

Mr. KLEINFELD. How long have you been in the cosmetic business?

Mr. WILLAT. Since 1929.

Mr. KLEINFELD. Do you have any scientific or technical background?

Mr. WILLAT. I graduated from Georgia School of Technology.

Mr. KLEINFELD. What degree?

Mr. WILLAT. Electrical engineering. Had chemistry there. I had 2 years of chemistry there and 2 years at John B. Stetson University in chemistry.

Mr. KLEINFELD. Will you read your statement, please?

Mr. WILLAT. This first page is a letter written by the two companies—mentioning the other part of the paper. I did not write the first page.

NOVEMBER 10, 1951.

Mr. VINCENT A. KLEINFELD,
Chief Counsel, House Select Committee on Chemicals,
St. Francis Hotel, San Francisco, Calif.

GENTLEMEN: The letter of October 25 from Mr. James J. Delaney regarding the investigation of the use of chemicals in the cosmetic industry has been received and acknowledged by telegram as requested.

The letter of October 25 to Willat Production Co., 1122 Folsom Street, San Francisco, has also been received and acknowledged.

Since the Willat Production Co. manufactures a majority of the goods distributed by Heatless Permanent Wave Co., and since the majority of the business of Willat Production Co. is with Heatless Permanent Wave Co., we are combining the answers to your letters to each company on this one statement.

Mr. A. F. Willat, president of Willat Production Co., a corporation, will represent both the Willat Production Co. and Heatless Permanent Wave Co. at the committee's hearing on Wednesday, at 9:30 a. m., November 21, 1951.

Mr. A. F. Willat has been in the manufacturing business for over 35 years in San Francisco and is the inventor of cold permanent waving and holder of five basic patents on the cold waving process. He is a graduate of Georgia Tech University.

That should be the Georgia School of Technology.

And this is my statement.

We are very much in favor of the investigation and study of the effect of the use of chemicals in the cosmetic industry, and will help in every way possible.

Our factory compounds and packages cold permanent wave hair-softening lotions and neutralizing materials for removing said softening lotions, hair-dressing creams in various colors, and a skin-protective cream for retarding skin softening by strong water-soluble chemicals. Our products, under the Willat brand name, are composed of well-known ingredients which have been used in the cosmetic industry for a long time. Our finished products have been on the market for from 5 to 10 years, in most cases.

The cold wave hair softening lotions we produce are the mainstay of our business. The ammonium thioglycolate cold wave lotions were first introduced by us some 10 years ago. At that time it was tested on animals by a recognized laboratory and found safe when made according to our formula. We also tested the lotion on humans before selling it through the regular trade channels.

Normally our products are not tested on animals unless we should desire to use untried and unusual ingredients, but all of our products are always tested on humans long before they are used on the public. Further, we usually field test our new products in one section of the country on a limited scale, first, to check possible reactions not found in preliminary tests. Experiments on animals do not give all the information desired.

Following is a list of chemicals which we use in our various products.

(The list referred to is in the files of the committee.)

It is important for the committee to realize that in most cases it is not the ingredients that go into a cosmetic that are so important, but the proportions used. For example, with the use of ammonium thioglycolate for hair softening lotions to make a permanent wave there is a vast difference in the proportion of the ingredients that various companies use.

Two lotions can be made so that they will both soften the same hair to the same degree under the same conditions of temperature and time, yet one can be safely put in the mouth and even swallowed while the

other would be so strong that it would remove the surface skin from the mouth which would remain sore for days. The latter product will irritate and burn the scalp of the patron and the skin of the hands of the operator, and the other lotion would not be felt by patron or operator. One would injure the hair by hydrolyzation, and the other would not.

I am sorry to have to state that most of the thioglycolate hair softening lotions on the market today are not as mild as they should be. The Willat Production Co. is the only one manufacturing lotions so mild that they can be put in the mouth and swallowed and applied to open wounds without further serious damage. The same hair can be permanent waved over and over again, one time right after another, for 10 times with our lotion and the hair will exhibit no injury that can be detected with the fingers or the eyes.

Allergies are, of course, a different matter and should not be confused with toxicity. Certain individuals may be allergic to any product, and no manufacturer can have any control over that. They should not be blamed any more than the farmer should be blamed for selling strawberries to those who might be allergic to strawberries.

Our recommendations are that there should be standards to guide the manufacturer. There should be standard methods for measuring injuries to hair and skin to help the manufacturer. Ingredients and data, according to standards, should be submitted to the Food and Drug Administration for approval. It should not, however, be necessary to list all the ingredients on the label.

The Food and Drug Administration should supply a list of chemicals that are or are not considered toxic under certain conditions. This list may be small at first, but should grow as required by the industry. The Food and Drug Administration should help, particularly the small manufacturer, by requiring testing on animals only when really necessary. In many cases, the Department could know beforehand whether there would be any likelihood of toxicity. Animal testing is a big burden for the small manufacturer and yet it is the small concern that has made some of the greatest developments in all lines.

Before ending this statement, I wish to have the record straight by making a few remarks about the letter sent to your committee by John L. Harvey of the Food and Drug Administration on September 13, 1951. The first and second paragraphs of this letter cite a case which obviously refers to me and to my original product for permanent waving in beauty shops by the cold or heatless method.

The actual facts are that the patron of the beauty shop in Atlanta who allegedly died as a result of the use of my product on her head in a beauty shop there, died of a heart attack and not from the process or lotion used. One of the proofs of this is that the family of the lady did not sue the manufacturer or the distributor of the lotion.

Some pertinent facts in this case are as follows: The lady had the measles at 40 years of age and should have been in bed at the time the wave was given—not in a beauty shop. The family doctor first declared it death from natural causes because she had a heart condition, but later changed his report to "poisons in the blood from a cold wave lotion." A complete report from an expert toxicologist and criminologist of the University of California showed that the lotion used could not have produced the poisoning under the conditions that existed.

The seizures were made but they were never contested in court because the thioglycolate lotion was discovered before the case came to court. The condemned lotion was ammonium hydrosulfide, and it had a strong sulfur-water odor. The new thioglycolate lotion had almost no odor so it was decided that nothing would be gained by contesting the Food and Drug Department decision in the courts. On the other hand, much would be gained by continuing the business with the new lotion.

Contrary to the letter referred to above, the sulfide lotion was pretested, not on animals, but first of all on the inventor himself, who made and used the chemical under extreme conditions which have not been made public.

After being sure that the ammonium hydrosulfide was entirely different from the poisonous hydrogen sulfide, I made waves in closed rooms for as long as 6 hours at a time on relatives, friends, and neighbors, for several years before installing in beauty salons.

The first salon installation was in 1938 in Oakland, Calif., and it was not until 1940 that the system was used in the East. Ninety thousand waves were given in beauty salons before the incident in Atlanta, and over 200 sworn-to testimonials were given by salon owners attesting to the wonderful lotion and asking for its return.

From the arbitrary decision made by the Food and Drug Administration in 1941, arises a very paradoxical situation. It is all right to drink sulfur water which contains the poisonous hydrogen sulfide, and it is all right to take baths in it. It is all right to take sulfur and molasses as a spring medicine, and generate so much hydrogen sulfide in the system that even gold jewelry worn by that person turns dark from it, but the Federal Food and Drug Administration would not allow anyone to ship ammonium hydrosulfide (which is very mild compared with hydrogen sulfide) across a State line for the purpose of making a permanent wave, no matter how dilute this lotion was.

Fifty thousand dollars worth of lotion was lost to our company a few months after I had borrowed money to get started. For months before the Atlanta incident the Food and Drug officials knew all about the product, but never made any prior move to stop its use or warn me.

In spite of this obvious injustice by the Food and Drug Administration 10 years ago, we still believe it is very important that the public be protected by such a department. The policy of the Food and Drug Administration, however, should be one of help for the manufacturer at the same time it protects the public.

Mr. JONES. Mr. Willat, when did this Atlanta incident occur?

Mr. WILLAT. The last of March in 1941.

Mr. JONES. And since that time you have taken that particular formula off the market?

Mr. WILLAT. Oh, yes; immediately.

Mr. JONES. And you are still operating your company and are still selling a cold or heatless permanent wave formula?

Mr. WILLAT. Yes.

Mr. JONES. Have you had any other difficulties or any unsatisfactory or objectionable experiences with the Food and Drug Administration since that time?

Mr. WILLAT. No; they have been very friendly and helpful.

Mr. JONES. You stated, "Ingredients and data for the standards should be submitted to the Food and Drug Administration for ap-

proval. It should not, however, be necessary to list all the ingredients on the label."

Do you have any great objection to listing ingredients, or do you list ingredients on the label now or not?

Mr. WILLAT. We do not.

Mr. JONES. You do not?

Mr. WILLAT. The reason that we do not, and the reason I am sure others in the industry would rather not, is because this business is quite competitive, and each company does not like to divulge to another company just what they are using in the product, whether that extra element that might be put in it might be of value or merely something to help the advertising.

Mr. JONES. But as a matter of practice can't any chemist analyze your product, and as far as competition is concerned, they do know what is in your product?

Mr. WILLAT. Because this is an organic substance, it is a little more difficult. Many chemists are unable to analyze it, at least easily.

Mr. JONES. Dr. Miller——

Mr. WILLAT. And it would prevent the very small company that makes products out of a bathtub and tries to sell without knowing what they are doing.

Mr. JONES. I didn't quite get that last. Would do what?

Mr. WILLAT. It would make it more difficult for the very small concern that produces a product out of a bathtub, that being the term that is often used, with almost nothing to work with, and without instruments, because they are usually the ones that do not know what they are doing, and it is not advisable.

Mr. JONES. I am not trying to discourage a man from getting started, but if a person does not have the proper facilities for analyzing and making tests, is not he the one who is most likely to cause harm to the public?

Mr. WILLAT. That is right.

Mr. JONES. Dr. Miller.

Dr. MILLER. Mr. Willat, I am not quite sure of your position. Do you feel that the Food and Drug Administration should be responsible for determining what you use in your various wave productions?

Mr. WILLAT. I think they should help a great deal, and in many cases they could tell before any tests are made by the manufacturer whether the product is safe or not safe.

Dr. MILLER. Do you think the manufacturer who wants to use some new chemical should be required to furnish to the Food and Drug Administration evidence that it is not harmful?

Mr. WILLAT. I think that would be all right.

Dr. MILLER. Then it would require you to make some tests.

Mr. WILLAT. In such a case you would have to.

Dr. MILLER. I notice on page 1 you say, "all of our products are always tested on humans long before they are used on the public."

Mr. WILLAT. That is right.

Dr. MILLER. How do you distinguish between human beings and the public?

Mr. WILLAT. Individuals that I know personally.

Dr. MILLER. You use them as guinea pigs?

Mr. WILLAT. To a certain extent. However, we never say "guinea pigs," because we are very, very sure before we experiment with any individual the possibilities of danger.

Dr. MILLER. Do you consider hydrogen sulfide in any proportions poisonous?

Mr. WILLAT. Hydrogen sulfide is a poison, very strong.

Dr. MILLER. What about sodium sulfite?

Mr. WILLAT. Sodium sulfite is not considered a poison in the Pharmacopoeia.

Dr. MILLER. In any dilutions?

Mr. WILLAT. You could take probably two or three tablespoons of it and it would act as a cathartic.

Dr. MILLER. How about a 50-percent solution?

Mr. WILLAT. That is much stronger than anyone would ever use. In fact, the strongest that we use is 6 percent.

Dr. MILLER. Part of the function of this committee will be to make a report and probably to suggest legislation that is necessary to protect the public. Our first interest is in protecting the public. Do you have any suggestions that you would want to make to the committee as to legislation that might be desirable in the interest of the public?

Mr. WILLAT. I think that the Federal Government should be the department to make the legislation first; the States should follow.

Dr. MILLER. What type of legislation would you suggest from a Federal standpoint?

Mr. WILLAT. Well, similar to what they are doing, but I would say that even a little closer to the drug department.

Dr. MILLER. You would not have objections to furnishing the Food and Drug Administration all the information that you have on the chemicals that you are using in the solutions?

Mr. WILLAT. I have already furnished all such information.

Dr. MILLER. Are there any concerns, so-called "bathtub concerns," that you speak of, making various types of wave solutions or materials that might now be sold to the public?

Mr. WILLAT. I think that most of them are not in existence now, but when the first home waves were put out about 1935, 1936, 1937, there were some 35 concerns putting out home waves, in which case they were then using plain sodium sulfite, which was not objectionable at all.

At the time that the thioglycolates became popular around 1943, 1944, 1945, the war was closing, and many people went into that field who had no information at all except what they would steal from some other person's product.

Dr. MILLER. How many companies now are engaged in turning out solutions for waves of different kinds?

Mr. WILLAT. Before I answer that, let me divide this just a little into two categories. One is the industry that supplies the beauty shops through jobbers, and then the other, the industry that supplies the stores for home use. I do not know how many home manufacturers there are. We are not in that class. As far as those who supply the professional trades are concerned, probably 10. I doubt if there are more than 10, but I wouldn't know exactly.

Dr. MILLER. Does California require that you have a license?

Mr. WILLAT. No.

Dr. MILLER. Do you think that would be a good thing in a Federal law?

Mr. WILLAT. I don't know why it wouldn't be. There would be no objection.

Dr. MILLER. Would that include those supplying the home trade?

Mr. WILLAT. Most definitely.

Dr. MILLER. I think that is all for the present.

Mr. JONES. Mr. Horan?

Mr. HORAN. I don't think I have any questions, Mr. Chairman, except I presume counsel will go into the matter of the Harvey letter upon which our action in expanding the scope of this committee was based.

Mr. KLEINFELD. I will be glad to.

Mr. JONES. Mr. Kleinfeld?

Mr. KLEINFELD. Mr. Willat——

Mr. WILLAT. Yes, sir.

Mr. KLEINFELD. Does the list of the chemicals or substances which you furnished in your statement contain every ingredient used in your products?

Mr. WILLAT. Yes, every one I could think of. I don't think that I have left anything out at all.

Mr. KLEINFELD. Are there any products which you haven't mentioned which you have used during the last 5 years?

Mr. WILLAT. No.

Mr. KLEINFELD. Will you please name each product which you manufacture or distribute and indicate what the purpose of each is?

Mr. WILLAT. I had the list here, and by memory I can say that I manufacture cold-wave hair-softening lotions, of which the basic materials are thioglycolates and thioglycerols.

Then there are neutralizers that are used afterward to neutralize the softening lotions. The neutralizers are made of sodium perborate, in a separate package from citric acid. They are put together at the time the neutralizer is made up by the beauty shop.

One other product mentioned is the hair dressing. It is purely an emulsion hair dressing—simple, with oils and tryethanolamine alkaline materials to make an emulsion, plus stearic acid. Then the colors would be approved colors.

Mr. KLEINFELD. I am asking you to describe the type of products you manufacture or distribute. What are they called? What are they?

Mr. JONES. You mean the trade names of the product?

Mr. KLEINFELD. What types of products do you sell? Cold creams? What are they?

Mr. WILLAT. Permanent-wave lotions, hair dressings, and a hand cream to protect the hands.

Mr. KLEINFELD. Anything else?

Mr. WILLAT. No.

Mr. KLEINFELD. Do you use any wetting agents in your product?

Mr. WILLAT. Yes.

Mr. KLEINFELD. Have you mentioned them?

Mr. WILLAT. I mentioned Oronite.

Mr. KLEINFELD. What does that consist of?

Mr. WILLAT. It is a trade name, put out by Standard Oil. It is in use quite a good deal in soaps.

Mr. KLEINFELD. Do you know what the chemical formula is?

Mr. WILLAT. No; I don't know the exact formula.

Mr. KLEINFELD. Are you a chemist, did you say?

Mr. WILLAT. I have studied chemistry but am not a graduate in chemistry.

Mr. KLEINFELD. Before you used the wetting agent, did you ask for the results of tests which had been made to prove that they might not be harmful?

Mr. WILLAT. I happen to know the vice president of the Oronite Corp., and I asked him and his chemist if it was all right to use it.

Mr. KLEINFELD. Did you see the tests?

Mr. WILLAT. No.

Mr. KLEINFELD. You just asked them?

Mr. WILLAT. That is right.

Mr. KLEINFELD. Did you make any tests yourself?

Mr. WILLAT. No.

Mr. KLEINFELD. You say on page 1 of your statement, Mr. Willat, that the cold-wave hair-softening lotions you produce are the mainstay of your business, that the ammonium thioglycolate cold-wave lotions were first introduced by you some 10 years ago, that at that time it was tested on animals by a recognized laboratory and found safe when made according to your formula.

Who made that test?

Mr. WILLAT. I don't remember the name. It was a New York laboratory. I was in New York at that time. I can get it for you, but I don't remember the name.

Mr. KLEINFELD. A rather important occurrence resulted from the use of this lotion; is that not correct?

Mr. WILLAT. Yes, I had the report on it.

Mr. KLEINFELD. You have the report?

Mr. WILLAT. I do have the report somewhere. It has been a long time ago. I would have to hunt for it.

Mr. KLEINFELD. You don't remember the name of the laboratory?

Mr. WILLAT. No, I don't remember.

Mr. KLEINFELD. You say you also tested the lotion on humans?

Mr. WILLAT. Yes.

Mr. KLEINFELD. How many people?

Mr. WILLAT. Oh, it is so long ago I don't know. I wouldn't say hundreds.

Mr. KLEINFELD. What would you say.

Mr. WILLAT. Probably 25.

Mr. KLEINFELD. For how long?

Mr. WILLAT. At that time, oh, a matter of months, just a few months.

Mr. KLEINFELD. Did you keep any records of the results of the tests?

Mr. WILLAT. No. All were satisfactory. I had none objectionable.

Mr. KLEINFELD. You say that you are sorry to have to state that most of the thioglycolate hair-softening lotions on the market today are not as mild as they should be. What do you mean by that?

Mr. WILLAT. Did I say "should" or "could"?

Mr. KLEINFELD. Most are not as mild as they "should" be.

Mr. WILLAT. All right.

Mr. KLEINFELD. What do you mean by that?

Mr. WILLAT. Well, as I explain a little bit later, lotions can be made so that they are very irritating or they can be made so they are not very irritating at all and still do the same work, that is, perform the same work in softening hair.

Mr. KLEINFELD. Are you saying there are on the market today other thioglycolate hair softeners which are irritating to people on whom used?

Mr. WILLAT. I would say, "Yes."

Mr. KLEINFELD. You would say, "Yes"?

Mr. WILLAT. Yes.

Mr. KLEINFELD. To whom do you sell your products?

Mr. WILLAT. How is that?

Mr. KLEINFELD. To whom do you sell your products?

Mr. WILLAT. They go to the Heatless Permanent Wave Co., as distributors, and then go to jobbers, and then beauty shops.

Mr. KLEINFELD. Beauty shops?

Mr. WILLAT. From jobbers.

Mr. KLEINFELD. Barber shops?

Mr. WILLAT. No, they are quite out of the class.

Mr. KLEINFELD. But not to the retail trade; is that right?

Mr. WILLAT. That is correct.

Mr. KLEINFELD. You state that you want to have the record straight concerning remarks made to this committee by John L. Harvey, Associate Commissioner of the Food and Drug Administration, and you cite what you say are the actual facts as to what happened to the patron of the beauty shop who received a wave with your product and died. You believe that the death was caused by some heart condition?

Mr. WILLAT. Yes; other complicating conditions along with it. The lady had undulant fever and some lumps in the back of the neck.

Dr. MILLER. What did the death certificate show as to the cause of death?

Mr. WILLAT. I think it was declared that it was accidental due to chemical poisoning in the blood.

Dr. MILLER. Then, that would be official, would it not?

Mr. WILLAT. I suppose it would be, but it doesn't mean it is truthful at all.

Dr. MILLER. Regardless of your opinion, that would be official.

Mr. WILLAT. Yes, sir; I suppose so.

Mr. KLEINFELD. In that connection, Mr. Willat, I have an excerpt from volume 116, No. 14 of the Journal of the American Medical Association.

Mr. WILLAT. 1941?

Mr. KLEINFELD. Yes. It contains an article entitled "Accidental death from absorption of heatless permanent wave solution," by several medical doctors. Here is what the article says, in part:

> On March 19 a healthy young married woman, mother of three children, drove her car, accompanied by a woman friend, from her home to Atlanta—a distance of 40 miles—where she had an appointment for 10:30 a. m. at a beauty shop for a heatless permanent wave. She arrived a little late, had her hair cut by the proprietor, an oil treatment and her hair prepared for the heatless permanent wave.
>
> Her friend went by the beauty shop about 2:30 p. m. She told her friend to go to a movie or do anything else she had to do, since the treatment would require more time than she had anticipated. A few minutes later, after the preliminary preparations had been completed, the treatment was started by a

trained operator. He had planned to continue it for 7 minutes. The procedure consisted in spraying the wave solution through a closed circuit of tubes into a rubber cap which had been sealed tightly over the head and covered all the hair, which had been previously wrapped in rows on curling tubes.

The operator had been spraying the solution for about four times a minute for about 3 minutes when the patron said, "Does this ever make one feel faint?" These were her last words. The operator stopped the treatment, applied the neutralizing solution and called for help. A physician was summoned, an ambulance called and artificial respiration begun, since the patron had turned a dark purplish. The physician and the ambulance arrived quickly. She appeared dead but was rushed to Crawford W. Long Memorial Hospital, where she was pronounced dead on arrival about 3 o'clock.

Now, here are the conclusions these medical doctors reached in this article in the Journal of the American Medical Association——

Mr. WILLAT. It sounds like it was put out by a Hearst paper; doesn't it?

Mr. KLEINFELD. Not to me.

The general conclusions in this article were—

The changes seen at autopsy were those compatible with the presence of either a circulating toxic substance or profound anoxemia or both. Chemical examination of the blood revealed strong evidence that the material applied to the patient's scalp had been absorbed and was present in the circulating blood. Furthermore, the evidence points to the probability that the absorbed substance was either hydrogen sulfide or ammonium sulfide.

The role of the destroyed areas of the scalp is uncertain. The presence of such lesions would certainly facilitate the absorption of such material as previously referred to. It cannot be determined from the examination whether the application of the curling solution produced the areas of destruction or whether they were there before the treatment.

Finally, both the clinical course shown by the patient at the time of death as well as the pathologic changes seen at autopsy were identical with those occurring in reported cases of acute poisoning with hydrogen sulfide. On this basis the opinion is rendered that the patient died of acute hydrogen sulfide poisoning as a result of absorption of such material through the scalp.

You disagree with this report made in the Journal of the American Medical Association?

Mr. WILLAT. Yes, sir; so do many others.

Mr. KLEINFELD. You also disagree with the death certificate?

Mr. WILLAT. Yes, sir.

Mr. KLEINFELD. I have here also an article entitled "Cosmetic Sensitivity," by Harley A. Haynes, Jr., M. D., reprinted from the Ohio State Medical Journal, March 1949.

In this article Dr. Haynes refers to a number of cosmetic irritations which apparently occurred due to the use of cosmetics. Here in part is what the doctor says, and I quote:

In the April 5 issue, 1941, of the Journal of the American Medical Association, an accidental death was reported from the absorption of a heatless permanent wave solution, presumably ammonium hydrogen sulfide with nonvolatile elements of free sulfur and ammonium sulfide. Death resulted within 24 hours following the application of this solution to the scalp. Needless to say, even animal experimentation could have revealed the toxicity of these products and prevented these catastrophes from occurring before their distribution and sale.

And you disagree with that, too?

Mr. WILLAT. I do.

Dr. MILLER. Then you think that hydrogen sulfide is not poisonous?

Mr. WILLAT. Hydrogen sulfide is poisonous, but it was ammonium sulfide and not hydrogen sulfide that was present. An entirely different chemical.

Dr. MILLER. You think ammonium sulfide is not poisonous?
Mr. WILLAT. Unless just by suffocation.
Possibly a little poisonous, because it is a chemical.
Dr. MILLER. You don't think ammonium sulfide could break down to hydrogen sulfide when it gets in the oil in the hair?
Mr. WILLAT. No. There isn't any chemical thatI know of or that I have ever heard of that when put on the skin for only 3 minutes could cause any such poisoning.
Dr. MILLER. Do you think you ought to be permitted to go ahead and use the same solution regardless of the findings of the experts in the case?
Mr. WILLAT. I don't want to because I have another solution.
Dr. MILLER. You think you should?
Mr. WILLAT. I should have had the right.
Mr. KLEINFELD. Mr. Willat, you say that one of the proofs of the fact that this lady died of a heart attack and not from any other cause is that the family of the lady did not sue the manufacturer or the distributor of the lotion. What do you think that proves?
Mr. WILLAT. I realize that I just put a superficial statement down there, which is still true. It isn't exactly a proof, but logically they should have sued.
Mr. KLEINFELD. Maybe they don't like to sue.
Mr. WILLAT. Maybe not, but I heard many stories afterward from relatives of the lady telling me that this lady was very sick and she should never have been there at all. You are not noting the points I have put there.
Mr. KLEINFELD. You do make the statement. You say, one of the proofs is that they didn't sue.
Mr. WILLAT. It is not extreme proof. Logically they should have sued.
Mr. HORAN. Will the counsel allow me to interrupt?
Mr. KLEINFELD. Yes, sir.
Mr. HORAN. I wonder if it would be possible for us to have the complete record from the toxicologist and criminologist at the University of California. That would be interesting to me, to study that testimony.
Mr. WILLAT. I can get that for you.
Mr. KLEINFELD. Will you submit it?
Mr. WILLAT. Yes. Shall I send it here or Los Angeles? I will have to look it up.
Mr. KLEINFELD. Just send it to the committee in Washington, D. C.
Mr. HORAN. That should be part of his testimony.
Mr. KLEINFELD. You don't have it with you?
Mr. WILLAT. No; I don't. I didn't know how far you were going into this matter.
Mr. KLEINFELD. Your statement discusses this situation?
Mr. WILLAT. Yes.
Dr. MILLER. I would like to ask if you agree with the toxicologist from California on his findings.
Mr. WILLAT. Yes.
Mr. HORAN. What was his name?
Mr. WILLAT. Dr. Kirk.
Mr. HORAN. Kirk?
Mr. WILLAT. I think Paul Kirk.

Mr. KLEINFELD. You say that $50,000 worth of lotion was lost to your company by reason of——

Mr. WILLAT. Seizure.

Mr. KLEINFELD (continuing). Arbitrary actions of the Food and Drug Administration.

Mr. WILLAT. Well, I would say it wasn't just fair, because I don't think they made tests to see whether it should be seized or not.

Mr. KLEINFELD. But in that case, since you spent $50,000, and since you are quite convinced that your product was and is safe, why did you waste all that money and just stop using your product?

Mr. WILLAT. $50,000 represents the selling value of that product. The cost to the manufacturer was small.

Mr. KLEINFELD. About how much?

Mr. WILLAT. About possibly 25 percent of it.

Mr. KLEINFELD. Anyway, notwithstanding this large amount which you mention in your statement, you did not wish to contest these seizures; did you?

Mr. WILLAT. No, because I had a lotion that I couldn't possibly compete with. The thioglycolate had practically no odor, and this had a strong odor requiring the necessity of having a ventilator, and the expense of putting that in was pretty great. So, there would be no possible chance of continuing with ammonium sulfide when a better lotion had already been discovered.

Mr. KLEINFELD. The only reason you discontinued using the product was not because there was some alleged danger but because you had something that smelled better; is that right?

Mr. WILLAT. That is right. It didn't have a strong sulfur odor, objectionable odor.

Mr. KLEINFELD. You weren't concerned with the possible effect of the former product; were you?

Mr. WILLAT. Yes, but I was not thinking it had that objectionable quality of being dangerous. I don't yet.

Mr. KLEINFELD. So that, if the new product didn't smell better, you would have continued using the old product?

Mr. WILLAT. I would have contested in court to get a reversal of it.

Mr. KLEINFELD. A large number of seizures of your product were made by the Food and Drug Administration?

Mr. WILLAT. Yes.

Mr. KLEINFELD. Why didn't you contest them?

Mr. WILLAT. Because I had the other product already before it went to court.

Mr. KLEINFELD. Do you know that in a suit like that the Government has to prove to the satisfaction of the court and jury that the product is dangerous?

Mr. WILLAT. That is right.

Mr. KLEINFELD. The burden is on them?

Mr. WILLAT. That is right.

Mr. KLEINFELD. You could have gone to court and said to a court and jury, "The Government must prove this case."

Mr. WILLAT. That is right.

Mr. KLEINFELD. You didn't choose to do so; did you?

Mr. WILLAT. No. It would cost a lot of money and gain nothing. Gain a lot of lotion that had already been seized, and by that time it would not be of any value to me.

Mr. KLEINFELD. Just what was arbitrary on the part of the Food and Drug Administration?

Mr. WILLAT. Because I don't think the Food and Drug Administration knew enough about the use of this product. I went to many books to find out, and very little information was given in any of the poison books regarding the use of ammonium sulfide. They did have plenty on hydrogen sulfide.

Mr. KLEINFELD. Let me understand this: You say they were arbitrary because they didn't know enough about it?

Mr. WILLAT. Didn't have full information; yes.

Mr. KLEINFELD. But they would have had to have proved it to the satisfaction of a court and jury?

Mr. WILLAT. Yes.

Mr. KLEINFELD. So, you could have proven them arbitrary in a court of law?

Mr. WILLAT. I could have.

Mr. KLEINFELD. But you didn't choose to do so?

Mr. WILLAT. It would take a lot of money, and I didn't have that.

Mr. KLEINFELD. Do you think the Government is arbitrary when it brings a lawsuit and you have an opportunity to defend yourself?

Mr. WILLAT. I think in this case they were mistaken. It doesn't always win its case.

Mr. KLEINFELD. And you think the American Medical Association was wrong, too?

Mr. WILLAT. I do.

Mr. KLEINFELD. Were they also arbitrary?

Mr. WILLAT. I would say "Yes." There is a lot to this case that never came out. And, of course, the doctor himself should be investigated that made the report.

Mr. KLEINFELD. What did he have to gain by making that report?

Mr. WILLAT. Well, he gained publicity.

Mr. KLEINFELD. Where?

Mr. WILLAT. In Atlanta, and all around.

Mr. KLEINFELD. So, you feel that the Food and Drug Administration was arbitrary in what they did?

Mr. WILLAT. Yes.

Mr. KLEINFELD. In bringing the lawsuit?

Mr. WILLAT. Yes.

Mr. KLEINFELD. Now, this is what the Food and Drug Administration says: It says that your firm placed the product on the market without any preliminary testing; that your firm was uncooperative in withdrawing the article from the market; and that it was therefore necessary to institute numerous seizures to remove outstanding stocks from the market.

Mr. WILLAT. That just isn't so. The Federal Food and Drug knew all about what I was doing. They came up and watched me make the lotions.

Mr. KLEINFELD. You learned about the death of this woman after it happened?

Mr. WILLAT. Oh, yes.

Mr. KLEINFELD. Did you try to remove the products from the market?

Mr. WILLAT. It was removed in a week. As soon as we got the information, stopped right away. We stopped it.

Mr. KLEINFELD. What did you do to remove it from the market?

Mr. WILLAT. Told everyone to not use it at all—just don't use it.

Mr. KLEINFELD. Did you write any letters to anybody, asking that the product be returned to you?

Mr. WILLAT. No.

Mr. KLEINFELD. Did you send any telegrams to that effect?

Mr. WILLAT. No; not to return it; just don't use it.

Mr. KLEINFELD. Did you offer to return the money they had paid for the product?

Mr. WILLAT. We didn't do that until after we had given the new lotion, and we gave them all lotion for the lotion that was seized.

Mr. KLEINFELD. How long did it take before you got physical possession of all the lots of the product?

Mr. WILLAT. What?

Mr. KLEINFELD. How long did it take before you had returned to you all the lots of that product?

Mr. WILLAT. It was not returned; it was seized and dumped. The Federal Food and Drug dumped it.

Mr. KLEINFELD. It was the Food and Drug Administration that seized it?

Mr. WILLAT. Oh, yes.

Mr. KLEINFELD. Do you from time to time change the proportions of the ingredients used in your product, or the ingredients themselves? Do you change your formulas in any way?

Mr. WILLAT. Slightly. To an advantage, however, definitely.

Mr. KLEINFELD. If someone has been using your product, and perhaps without any untoward effect, and you change either an ingredient or the various proportions, may that not cause some different reaction?

Mr. WILLAT. Well, after all, we do have means of determining what would be the logical thing to happen, and I can give you an exact illustration. If I use a lotion that has a large quantity of ammonia and then later I reduce the quantity of ammonia, I am helping the lotion, having less toxic and less danger of the hydrolyzation than with large quantities of ammonia. We did do that.

Mr. KLEINFELD. You say the cosmetic industry is highly competitive?

Mr. WILLAT. That is right.

Mr. KLEINFELD. And that is the reason you don't want to set forth your ingredients on your labels?

Mr. WILLAT. I would say what we call stock in trade. It gives each one an opportunity to sell their product as being distinct from the other. It is really a minor point. I wouldn't even say it had to be that way, but I think it would be more satisfactory not to put everything on. But the important ingredients could be put on the label.

Mr. KLEINFELD. The drug industry is competitive, but the drug manufacturers and distributors have to put the names of their active ingredients on their labels. They apparently are not afraid of giving away some so-called secret formulas. Food manufacturers compete against each other, yet they put on their labels the common and usual names of the ingredients in their nonstandardized foods. These concerns seem to be able to continue in business. Why should you not name your ingredients on your label?

Mr. WILLAT. Under the present situation everyone can't go in the drug business. They have to, in the first place, answer quite a long questionnaire.

Mr. KLEINFELD. No; that is not so.

Mr. WILLAT. For a drug.

Mr. KLEINFELD. No.

Mr. WILLAT. To put out a drug?

Mr. KLEINFELD. That is right. They can put out drugs just as you can put out cosmetics. But they have to state on their labels the names of the active ingredients of their products.

Mr. WILLAT. They also answer quite a long questionnaire. I happen to be making for the San Francisco Drug Co. a product today. It is not my own. I merely package it. I know they went to a great deal of trouble to get all the detail to the Federal Food and Drug Administration.

Mr. KLEINFELD. It may be, Mr. Willat, you are thinking of so-called new drugs.

Mr. WILLAT. I would say "Yes."

Mr. KLEINFELD. As far as new drugs are concerned, information as to safety must first be given to the Food and Drug Administration. If it is not a new drug, and most pharmaceuticals and drugs are not, they can be put out without prior clearance.

Mr. WILLAT. This happens to be.

Mr. KLEINFELD. They have to set forth on their labels the names of the active ingredients so that people will know what they are getting, or at least have the opportunity of knowing what they are getting, or of going to somebody and finding out what these various ingredients may or may not do to them.

Mr. WILLAT. Yes.

Mr. KLEINFELD. We had dermatologists here yesterday testify that sometimes small numbers of people, and sometimes considerable numbers of people, have certain undersirable reactions to various cosmetics. Should you not at least afford them the opportunity of knowing what they are using?

Mr. WILLAT. I think if the Food and Drug Administration says that it is all right, and they have the information, I don't know why it needs to be on the label, because the people who use this know nothing about what they are reading.

Mr. KLEINFELD. But there are hundreds of ingredients used today about which the Food and Drug Administration does not know anything. They don't know what you use in your product.

Mr. WILLAT. I tell them.

Mr. KLEINFELD. Not everybody does.

Mr. WILLAT. I think there should be a law requiring that it be told. I don't want to hide anything from the Food and Drug Administration at all—not a thing.

Mr. KLEINFELD. Do you think there should be a law requiring that the people in the cosmetic industry who are manufacturing or distributing cosmetics be required to prove that their cosmetics are safe before they are marketed?

Mr. WILLAT. Well, that is just a slightly different question. I think that should be done in cooperation with the Administration, and if it is a new product, such as thioglycolate was when it came out, I would say, "Yes, that should be tested on animals first."

Mr. KLEINFELD. And according to these reports, if that had been done with your product this woman might still be alive?

Mr. WILLAT. No; I had already many, many waves on humans without any trouble at all—many.

Mr. KLEINFELD. Twenty-five, you said?

Mr. WILLAT. No, no; not on that one. On this ammonium hydrosulfide. Hundreds and hundreds of waves were made with it. I had sold the product, and people did it right out in the open. The odor was so strong you could smell it for blocks.

Mr. KLEINFELD. Did you keep records?

Mr. WILLAT. I didn't have anything to record. I never had any problems of any kind at all. They were all perfect.

Mr. KLEINFELD. So it is true, as far as that point is concerned, you have no record of any tests, and, as far as the cause of the death of this woman is concerned, you disagree with these various authorities?

Mr. WILLAT. Definitely.

Mr. KLEINFELD. No further questions.

Dr. MILLER. Do you carry a product liability insurance?

Mr. WILLAT. Yes.

Dr. MILLER. Did you carry it at the time this incident occurred?

Mr. WILLAT. Yes.

Dr. MILLER. Did they make any settlement?

Mr. WILLAT. No; they wouldn't, because they said I did something against the law. They merely took up from where the Food and Drug——

Dr. MILLER. You do carry protection?

Mr. WILLAT. Oh, yes.

Dr. MILLER. Then you do agree that the public is entitled to proper protection in the use of ingredients that might be harmful?

Mr. WILLAT. Absolutely.

Dr. MILLER. And you would have no objection to a law or regulation that would put into effect greater protection for the public?

Mr. WILLAT. That is right.

Dr. MILLER. Even though it would be detrimental to you as a manufacturer of products?

Mr. WILLAT. That is right. I want to say one more——

Dr. MILLER. That is a healthy attitude.

Mr. WILLAT. I would like to say, if I may, I would like to see the Federal Government be the testing means, if possible, because then there wouldn't be a lot of duplication. If each manufacturer has to make animal tests on the same kind of products, there is simply a loss of waste motion. If the Federal Government did it, it would be done once or as many times as necessary.

The fact that it would cost a little bit more to do that—I am perfectly willing to pay my share of taxes because of this, and I would rather see much more money spent on saving the public than in burdening them with war.

Mr. KLEINFELD. When you use a new ingredient what precautions do you take with respect to testing each ingredient for toxicity?

Mr. WILLAT. Well, most of the materials that we use should not need any testing at all. Just the same as we would buy salt or soda, the same as you would buy fruits, we depend on the large manufacturer we buy it from to have made all the tests necessary.

Mr. KLEINFELD. Do you ask them whether they have made tests?

Mr. WILLAT. No. We buy the product from a standard company. In other words, if I am going to buy some sodium perborate, I am not going to test it afterwards, because in my work of compounding, if there was anything that would be wrong about it, my compounding would come out entirely wrong. In other words, my pH. would be wrong, or the strength, its curlability, of the lotion or softening or hardening ability for the neutralizer would be all wrong and it wouldn't work properly. But every batch of the solution that is made is always tested on hair before that batch is bottled, and it must produce a certain size curl under certain definite controlled conditions.

Mr. KLEINFELD. Well, what kind of conditions?

Mr. WILLAT. Oh, I happen to be in an unusual position regarding cold waving because I started it, and I watched it carefully since 1934. I have means of testing lotions for their ability to soften hair without injury, and I do it very accurately. I have charts and standards to go by.

There is no such thing as a standard hair, but I have a standard lotion which I use to correct a large quantity of the same kind of hair that I would use to test with. In other words, I standardize a large quantity of hair, and until that is used up, that has a definite standard and everything is compared to that. That hair will be curled under controlled conditions of size, temperature, and time.

Mr. KLEINFELD. Do you make any tests on animals?

Mr. WILLAT. No.

Mr. KLEINFELD. Do you have anybody make them for you?

Mr. WILLAT. That is rather a general statement. I did tell you that I made tests on animals at the time that we first used the thioglycolates.

Mr. KLEINFELD. Now?

Mr. WILLAT. No; there is nothing for me to test, because I am not making any changes. I have been making so many, many thousands of waves.

Mr. KLEINFELD. You say you change your formula from time to time?

Mr. WILLAT. Very, very little. I said always in favor of the public.

Mr. KLEINFELD. All right. That is all.

Mr. JONES. Anything more?

Mr. HORAN. I have one question.

If the chairman will permit, I would like to ask Dr. Lemmon if the State of California has any jurisdiction in the field of cosmetic manufacture?

Dr. LEMMON. Not the bureau of chemistry, department of agriculture. If there is someone here from food and drug, they could answer that better as far as the department of public health is concerned.

Mr. HORAN. Mr. Duffy is not here, is he?

Dr. LEMMON. I know there is a licensing law on those that are in the cosmetic trade as far as applying the materials and so on—beauty operators. But I don't know of any licensing law as far as cosmetics themselves are concerned. But the people here who are interested without doubt do know.

Mr. HORAN. I just want to say this before I ask Mr. Willat some questions: I personally am very happy and very much impressed with the responsibilities that the people in the government of the State of California take in the interest of their own manufacturers and pro-

ducers, and I just wondered if they had any jurisdiction here. We have the problem of ascertaining how the law should be modified, if at all, and how it should fit into our pattern of life. Certainly we can agree with the witness that we don't want any arbitrary action.

But it is not at all clear to me the circumstances under which this seizure was made in 1941. When did you first hear of that seizure?

Mr. WILLAT. It was rather interesting because——

Mr. HORAN. Just tell me.

Mr. WILLAT. The man who performed the wave sent back a clock. He sent a post card first stating that a lady died while getting a wave and she knocked the clock off, and to please send him another one. That is the first information I had.

When we found out it had been set for the 8 minutes, it had been knocked off in 3 minutes, because it broke the clock, we had definite information of the fact that it was only 3 minutes on the head.

Mr. HORAN. What was your first message from the Food and Drug Administration?

Mr. WILLAT. After the report came out from the American Medical Association, I think it was just after that that the Federal Drug Administration notified us of seizures—that they would seize—and to give them information where they were and so forth. We gave them everything they wanted. We had no trouble at all with the Administration as far as cooperation is concerned.

Mr. HORAN. Counsel will have to correct me, because from personal experience I know libel actions are taken when Food and Drug has to seize interstate shipments of food, and that is taken to court, and the analysis is presented to the court and proof is made that the shipment was libelous, it did not conform with the certificate of sanitation which enabled it to cross State lines.

Mr. WILLAT. Right.

Mr. HORAN. What action was taken against you? That is what I am trying to get at.

Mr. KLEINFELD. Exactly the same action.

Mr. HORAN. You were libeled then?

Mr. WILLAT. And they never pushed the case at all, dropped it entirely.

Mr. KLEINFELD. What do you mean, dropped it? The Government got a default judgment, didn't it?

Mr. WILLAT. I mean as far as personal liability is concerned for shipping poison, so-called, across the State line, they did nothing about it.

Mr. KLEINFELD. Isn't it a fact that the Government instituted a number of seizure actions against your product, and a number of default judgments were rendered, and you did nothing?

Mr. WILLAT. Yes. They could have gone further, they could have prosecuted me for having put it out.

Mr. HORAN. I will go a long way to guard a producer against arbitrary or dilatory action by the Food and Drug Administration. But I have, of course, to hold in clear view the responsibility of the producer also, that he know his ethical place in the picture. I would just like to know what action—where was the proof from the Food and Drug Administration?

Mr. WILLAT. I tried to find out what they did to prove. They would not tell me. I heard in a roundabout way that they had taken

rabbits, and the report came to me that they doused them in this lotion and they died in a certain length of time, and so forth, but I proved something different. I——

Mr. HORAN. I don't want to know what you did. The thing I will not be satisfied—I don't intend to leave this room until we hear from the Food and Drug Administration as to why they seized this $50,000 worth of product.

Is there a representative of the Food and Drug Administration here?

Dr. WEILERSTEIN. Yes.

Mr. HORAN. Would you see we have the findings in this case and have them here as part of the record.

Mr. JONES. Is this what happened—in other words, the Food and Drug Administration seized your product, you were notified by the court, and you didn't contest the action?

Mr. WILLAT. That is right.

Mr. JONES. He did not contest. In other words, if there are seizures and you don't contest it, that is all there is to it.

Mr. KLEINFELD. Here is what happened, what must have happened, and what always happens in these cases: Here a product was put on the market and the manufacturer is not required by existing law to come to the Food and Drug Administration and say, "Here is what is in it." He is not even required to put his ingredients on the label. Then somebody dies and information is immediately wired to the Food and Drug Administration, "This lady was killed." A reputable medical doctor, as indicated by the reports I have read, tells the Food and Drug Administration, "In my opinion this product killed the woman and may kill other people."

There is obviously a danger to the public. Therefore they step in, as is their duty, to seize the product and take it off the market. That is the situation. Otherwise other people might have been killed while they fooled around.

Mr. JONES. Of course, it is not Food and Drug's responsibility to try to sue anybody for damages for it. That would be the person who was damaged.

Mr. KLEINFELD. That is right. Their duty was to protect the public by getting this dangerous product off the market.

Mr. JONES. I say it would not be the Food and Drug's responsibility to try to sue anybody for damages for putting it in there.

Mr. KLEINFELD. They have no such authority.

Mr. JONES. They stop the sale.

Mr. WILLAT. It was put in the hands of the FBI, I understood, and it was up to them.

Mr. JONES. I think we can get this information from the Food and Drug Administration, and I think we have probably got all the information here we can.

If there are no further questions——

Mr. HORAN. Mr. Chairman, I would like to have the reason for the Food and Drug actions in this case in the record, because I think it is vital to our consideration of any modification of existing law that we might recommend.

Mr. JONES. We are going to do that.

Mr. KLEINFELD. I would like to read one notice of default judgment, a few lines with respect to what actually happened in one seizure against this gentleman's product.

On April 11 and May 8, 1941, the United States attorneys for the southern district of New York and the western district of Texas filed libels against the following quantities of Willat Method of Heatless Permanent Waving: 19 cartons at New York, N. Y., and 270 units at San Antonio, Tex., all lots of which had been consigned by the Heatless Permanent Wave Co. from San Francisco, Calif., within the period from on or about December 24, 1940, to on or about March 20, 1941.

The libels charged that the article was adulterated in that it contained a poisonous or deleterious substance, ammonium hydrogen sulfide, which might have rendered it injurious to users under such conditions of use as are customary or usual.

On September 15 and November 18, 1941, no claimant having appeared, judgments of condemnation were entered and the product was ordered destroyed.

In other words, the charge was that the product contained a poisonous, deleterious substance which caused the death of one person and might cause the death of others unless the Government stepped in and took it off the market.

Mr. WILLAT. Cyanide potassium put on the scalp for 3 minutes wouldn't kill anyone. Ninety thousand waves had been given without any trouble.

Mr. JONES. I think we have all the information, unless there are other questions, and I want to thank Mr. Willat for this information.

Mr. WILLAT. Thank you.

Mr. JONES. Who is the next witness.

Mr. KLEINFELD. Mr. Markel.

(The oath was administered by the chairman.)

TESTIMONY OF LEON MARKEL, CHIEF CHEMIST, REPRESENTING THE DUART MANUFACTURING CO., LTD., SAN FRANCISCO, CALIF.

Mr. KLEINFELD. Mr. Markel, will you state your name and the firm you represent, please?

Mr. MARKEL. My name is Leon Markel, and I represent the Duart Manufacturing Co., Ltd., 984 Folsom Street, San Francisco.

Mr. KLEINFELD. You are Leon Markel? This letter is signed by Jesse M. Markel.

Mr. MARKEL. That is right. That was written by the secretary of the corporation.

Mr. KLEINFELD. What is your position with the corporation?

Mr. MARKEL. I am a chemist. You were advised in this letter that Mr. Leon Markel would appear before the committee.

Mr. KLEINFELD. That is right.

Mr. JONES. Mr. Kleinfeld, will you conduct the interrogation?

Mr. KLEINFELD. What is your academic background, Mr. Markel?

Mr. MARKEL. I received a bachelor-of-science degree in 1934, College of City of New York, where I majored in the science of chemistry.

Dr. MILLER. What college?

Mr. MARKEL. College of the City of New York.

Mr. KLEINFELD. Where you majored in chemistry?

Mr. MARKEL. Yes.

Mr. KLEINFELD. When were you graduated?

Mr. MARKEL. 1935.

Mr. KLEINFELD. What did you do subsequent to that time?
Mr. MARKEL. Chemist for Duart Manufacturing Co. since 1935.
Mr. KLEINFELD. Up to the present time?
Mr. MARKEL. To the present time.
Mr. KLEINFELD. Please read your statement.
Mr. MARKEL. Pursuant to your letter of October 25, we are supplying the information regarding the cosmetics we manufacture.

Duart Manufacturing Co., Ltd., is a California corporation which has been in business for approximately 35 years. Most of the products that we manufacture are sold to beauty supply wholesalers, who in turn resell to beauty shops. The beauty shops are the ultimate consumers, as they use our products in giving permanent waves, and so forth, to their patrons.

Others, and a smaller percentage, of our products are sold to drug wholesalers, chain drug stores, department stores, and so forth, for sale to the public at the retail level.

All the products that we manufacture are covered by products liability insurance and a complete record is maintained of all claims made regarding our products. We feel quite safe in saying that, considering the volume of our sales and the number of units of our products that are sold, the number of claims made is extremely small. This is substantiated by the fact that the premium on our products liability insurance is showing a substantial downward trend. For instance, when we renewed our products liability insurance in 1950, we obtained a rate reduction in our premium of 10 percent. Again, when we renewed our products liability insurance in 1951, we obtained a further rate reduction in our premium of 7½ percent. Bearing in mind that insurance rates are based on actual experience, these reductions are certainly significant.

In regard to the various tests which are conducted by us on our products, we submit the following:

(1) First, we attempt to use only those ingredients which are recommended by the suppliers for the purpose to which we put them, and we deal with manufacturers of the highest reputation.

(2) We use only ingredients of the highest grade available. By so doing, the impurities are reduced to a minimum.

(3) We maintain controls in manufacturing.

(4) We subscribe to the technical journals in our field and keep abreast of the research and experimental work that is being done in our field. Furthermore, we have a complete file of the sales literature and specifications on the various raw materials we use.

(5) We employ skilled technical personnel.

(6) We rely on the experience we, and our personnel, have accumulated over the years.

(7) We do not attempt to manufacture or sell products that have therapeutic properties and we therefore steer clear of any items that contain powerful germicides.

(8) Where we contemplate manufacturing a product of a type already on the market, we first thoroughly investigate those products.

(9) After developing new products, we test them thoroughly in our own laboratory, in a beauty shop which we maintain on our own premises, in limited markets, and in schools of beauty culture.

A new product must satisfactorily pass all these stages and tests before we attempt to sell and distribute it on an unlimited basis.

(10) Wherever we feel it indicated, we submit our new products to an outside independent laboratory for further testing.

Ingredients used in our products:

(The list of ingredients is in the files of the committee.)

Mr. JONES. What products do you manufacture? I mean what type of products—hair waves?

Mr. MARKEL. We manufacture products almost exclusively for the hair—shampoos, hair-coloring material, hair-waving materials. We also manufacture the devices and appliances that are used in applying these lotions to the hair.

So far your testimony has revolved about cold waving. There are, however, other means of waving. There is the use, for instance, of chemical heating mechanisms and electrical heating mechanisms. We manufacture all three types—cold-wave mechanism of curling hair; the chemical heating method, as it is called, in which heating ingredients are included in a small aluminum foil envelope and are activated by moisture; and, third, electrical heating method, in which a small electrical heating device is placed around the curl, the curl previously having been wound on a mandrel, and the heat, in conjunction with certain reagents, causes the hair to assume a permanently curled position.

Mr. JONES. What facilities do you employ in determining the toxicity, if any, of any of the products that you manufacture or distribute?

Mr. MARKEL. Well, first off, as I have stated, we attempt to stay with products which major manufacturers of basic materials have advised us are satisfactory for use in cosmetics.

Mr. JONES. Do you rely entirely upon the tests that are made by someone else, or do you actually conduct your own tests or have some reputable laboratory conduct them?

Mr. MARKEL. In some cases we employ laboratories.

Mr. JONES. In what cases?

Mr. MARKEL. There haven't been too many of such instances. For instance, if we contemplate going into a field in which such information is not available—for instance, if we are going to put out a hair rinse containing, for argument's sake, basic dyes, and there is very little history behind it in the journals, in our trade papers, then we submit our product to independent laboratories for testing under the conditions under which they will be used in the field.

Mr. JONES. Just as an example, do you conduct any tests or have tests made to determine whether any of the chemicals used in these products would be injurious to the eyes if it should get in there?

Mr. MARKEL. No.

Mr. JONES. You don't make any tests like that?

Mr. MARKEL. In the first instance we did make specific eye tests, but dyes are treated as a separate category in the Food and Drug Act. There are special provisions and exemptions made for certified and noncertified dyes.

If you have noticed the package, it bears certain legends advising that it be kept out of the eyes and certain tests be made preliminary to use. That is the reason why we made eye tests in this particular instance.

Mr. JONES. Do you have tests made to determine whether or not any of the chemicals used might produce an eczema?

Mr. MARKEL. No; but we rely on a large volume of tests made in our own organization, in our own beauty shop. We maintain one in our factory. And we run these tests on hundreds, sometimes hundreds of cases, before a new product is introduced. We keep the records of the people involved, the names, addresses, as a rule samples of their hair before and after treatment. We bring them back on follow-ups on weekly intervals and monthly intervals. We contact them by phone, and so on.

Mr. JONES. In other words, all your tests are conducted on human beings?

Mr. MARKEL. That is correct.

Mr. JONES. Dr. Hedrick?

Dr. HEDRICK. Are you familiar with the shampoo recently put on the market that caused blurring of the cornea of the eye?

Mr. MARKEL. I have received some general information on it.

Dr. HEDRICK. That was not made by your company; was it?

Mr. MARKEL. No. I have received information that two ingredients were suspect. One consisted of a nonionic polyoxyethylene type surface wetting agent. The second ingredient was a quarternary ammonium detergent, lauryl isoquinolium bromide.

I am not absolutely certain that these two were the offenders, but I believe my source of information was correct on them.

Dr. HEDRICK. How many new products does your company bring out yearly?

Mr. MARKEL. I would say if we average one a year—I would say one or two. Of course, some products might in the strict sense of the word be called new—the packaging is changed, the label may be changed, but basically the formulation is more or less identical.

Dr. HEDRICK. Before you put one of these new products on the market, how much experimentation do you do on the prepartaion?

Mr. MARKEL. If a completely new product, I would say our experimentation goes through a long period of time, sometimes a period of a couple of years.

Dr. HEDRICK. What would be the shortest period of time?

Mr. MARKEL. Well, I can only really recall one product that I can say was strictly a new development. That was a hair-coloring material which we put out, and in that our experimental work ran over a period of several years, in spite of the fact that we had the advantage of other people's experience and background. By that I mean we employed technical personnel who had had many years experience in this field prior to their being employed by our company.

In this product we took extreme pains from many standpoints, not only because of the safety of the person who might ultimately use the product, but because of the appearance. It was a hair coloring, and naturally you don't want a person's hair to turn an unbecoming shade. So there was considerable experimental work involved in it and a tremendous amount of pretesting work.

Dr. HEDRICK. Have you ever had a preparation that turned the hair green?

Mr. MARKEL. Well, of course, everybody in the hair-dye business might say they have heard of a case like that occasionally. I couldn't say definitely that we have, but I would not be surprised if we had. Those things are unaccountable for. It is difficult to understand why,

when you turn out a million applications a year and you don't have any such incidents, why next year you may pick one up.

I can only fall back on our products liability insurance, which we state was based purely on experience. If you have cases, the insurance has to pay out on them, and your rate rises. If your experience is good, and we have been very fortunate in that, and I think our caution has been to a great extent responsible for that, why, our rate drops year after year.

Dr. HEDRICK. Do you have any trouble with alopecia from dyes you use on the hair?

Mr. MARKEL. No; I haven't had any such experience. Let me point out in this thing that we are very conservative in our outlook on these products. I mean we are not the first to get into any of these fields. I would say we are close to being the last in it.

We try to approach all these problems naturally from the standpoint of safety, but also from the standpoint of our reputation. We have been in this type of business for 40 years, and under this present name for over 35. We have a reputation to maintain. We have a very substantial investment in equipment, because, as I say, we manufacture not only the chemicals or reagents, but also the devices, and we must be zealously on guard at all times that nothing we do will affect that reputation.

Dr. HEDRICK. How many States do you do business in?

Mr. MARKEL. We do business in all the States.

Dr. HEDRICK. That is all.

Mr. JONES. Dr. Miller?

Dr. MILLER. I have one or two questions.

On page 2, item No. 9, you say, "After developing new products, we test them thoroughly" by the three or four methods you speak of in your laboratory. Do you use animals for your tests?

Mr. MARKEL. No; we don't.

Dr. MILLER. What do you do in your laboratory to test these products?

Mr. MARKEL. Well, if you have a product, naturally when it is introduced into trade you must figure that it may possibly be a couple of years before it was used, or the wholesaler might take his latest shipments and keep putting them in front and his earlier shipments in back, and he might not reach or offer for sale some of our products for a period of years. It must be subject to a decomposition test under certain circumstances. If a jobber is located in a warm place, for example, in Texas, he may have his storehouse in a broiling sun under a sheet-metal house for months, and under our conditions we must be sure the product within a reasonable time analyzes and assays up to predetermined standards and if decomposition has taken place.

Dr. MILLER. In No. 7 you say, "We do not attempt to manufacture or sell products that have therapeutic properties," and then on the next page you list the number of ingredients that you do use.

Mr. MARKEL. Yes.

Dr. MILLER. Would you say that ammonium carbonate, potassium hydroxide, sodium bromate or potassium bromate, and a number of others have no therapeutic properties?

Mr. MARKEL. This is what I mean: I can see what you are driving at. What I have in mind is, we don't sell any of our products as

dandruff cures or alopecia cures, as acne or blemish removers. We don't get into that type of work at all. Our products have strictly a functional reason.

Dr. MILLER. I notice you use some Tweens. Do you know what is in the Tweens?

Mr. MARKEL. Yes. We have used them successfully over a period of 10 years—emulsifiers.

Dr. MILLER. In your shampoos?

Mr. MARKEL. No; not in shampoos. Tweens are a vast line, and I guess there are 30, 40, or 50 of them, and all of them of varying composition.

Dr. MILLER. Do you know what the basic properties or basic formula or chemical is in the Tweens?

Mr. MARKEL. Yes. I believe I brought the general classification into which they fall.

They are polyoxyethylene sorbitan esters. Not ethers, but esters, which is a big distinction from the materials which were suspected in the two shampoos which were seized. They were ether types. These are esters.

Dr. MILLER. They were suspect in the two shampoos seized?

Mr. MARKEL. As of the present moment I have not received any information as to what ingredient lay at fault.

Dr. MILLER. You apparently are doing quite a large business and are apparently doing the best you can to protect the public.

This committee will be interested in suggesting legislation to the proper legislative committee. Have you any suggestions relative to changes in the law or new law or regulations that might be adopted for the protection not only of you as a manufacturer but principally of the public?

Mr. MARKEL. Naturally, my viewpoint stems from my own experience of being out here on the west coast in San Francisco where there are very few manufacturers of primary or large manufacturers of our type of product. I wouldn't particularly be in a position to make any suggestions.

Basically our products go to beauty shops. A very small proportion of them go to the retail trade where a woman goes in and buys one in a chain store, under conditions of that type. They are used by licensed beauticians under controlled conditions.

At home when a person shampoos her hair there is likelihood of getting it in the eyes. We have all had that experience and there is no use denying that. In a beauty shop I doubt whether anybody would go back to the same shop if they let soap get in their eyes and down the back of their neck. Conditions are more or less controlled.

So I do not think I could be of particular advantage in outlining any course of legislation on this. It varies with every company, the type of products they put out and so on. We have been very fortunate.

Dr. MILLER. That is all.

Mr. JONES. Mr. Horan, do you have any questions?

Mr. HORAN. Is it true that if one manufacturer of cosmetics becomes suspect the tendency is for all manufacturers to become suspect?

Mr. MARKEL. That is inescapable.

Mr. HORAN. You have no objection then to any codifications in the law that might act toward protecting you as an individual in that field?

Mr. MARKEL. Well, I wouldn't have any objection to certain types of legislation. Of course, that is a very general statement. It depends on what it entails, what obligations, or how practical those obligations are to us.

In the field of suppliers and manufacturers who deal primarily with the beauty shop, size is comparatively small compared to those manufacturers who market and sell products at the retail level. In our terms they are gigantic. They are many times our size. What their facilities are, methods of testing are, I can't say. I only know that by hearsay or what I have read. I don't know what would be satisfactory for them and satisfactory for us at the same time.

Mr. HORAN. Well, of course, we are striving to understand the problems in this field and to have a government of law rather than men. The assertion has been made of arbitrary action on the part of the Food and Drug Administration in a case a previous witness brought up. Of course, that is government by men instead of by law. We are going to attempt to study this thing and make our recommendations. Would you object to having explanatory matter required on your label?

Mr. MARKEL. Well, I would, and I will tell you why. We have to understand this thing and look at it as impartially as we can. I don't know what the procedure is that the Food and Drug Administration follows in various parts of the country. I couldn't state that. I am not in a position to, and I don't know the facts. I only know my own situation.

Periodically they come into our plant. We have never made it a practice to withhold formulas even in the case when there was some question as to whether they were legally entitled to them. We turned over our formula card and they inspected our plant carefully with flashlights and all types of visual methods. They questioned me closely. Sometimes they would come in for almost a day at a time and go over everything. They know our formulas.

Their people, I presume, who handle their cosmetics division are as competent as I am in the types of material that are used in products. The literature is available to anyone. From that standpoint I think the industry and the public gets a great deal of protection. How well it is carried out, as I stated before, I don't know.

The point I am making is that under the provisions of the law with which I am familiar—and I make no pretense of being an expert at it—there are large parts of it I am not capable of making an expert judgment on. On the ones I have described I think they have considerable power.

Now if an inspector knows his business and he reads down a list of ingredients and he has experience in the field, he would probably be in a position to tell a manufacturer whether he was skating on thin ice in incorporating a certain percentage in them.

We all know what cold waves are. I don't think there has been another product on the American market that has been written up to such an extent over the last 10 years. The technical journals are full of information. Just by looking at a formula should tell a man of experience whether it is good or it is bad.

Mr. HORAN. Could you tell me now what body of men or what procedures exist to create or to certify the standards?

Mr. MARKEL. I didn't hear the first part of that question.

Mr. HORAN. Can you tell me what board or institution in our society exists today to create and certify the standards under which a Food and Drug administrator or agent might enter your plant and do check work around your institution?

Mr. MARKEL. What specific law there is?

Mr. HORAN. What body or institution enables the food and drug inspector to have standards against which he might check your operation.

Mr. MARKEL. That would be strictly a matter of his own competence, I would say.

Mr. HORAN. That is the point. Who is going to state in certain fields what the tolerance is on spray residues on fruits, vegetables? In some other fields who is going to say whether or not a certain chemical is in itself toxic? Who is going to make those determinations? We have already had an argument between a manufacturer and the Food and Drug in which he asserts that a doctor out here at the University of California stated that it was not toxic. Yet the American Medical Association, as counsel read about, said it was. It created a condition of extreme confusion.

Now if the Food and Drug Administrator is going to act with confidence in his own work and in such a way that you are going to have confidence in him when he comes into your plant, we ought to know where those standards were developed and whether they are authentic, and so forth. And you know of no such way of finding out what those standards should be?

Mr. MARKEL. No. The field—and I am testifying as an expert strictly in a narrow field here. I have had about 17 years' experience in a very narrow field, and I have attempted to keep abreast of all the information and literature in it, and to develop standards even for that narrow field would be a mountainous task. There are so many ingredients used, so many of them that vary so slightly from other types of ingredients.

Mr. HORAN. Well, my colleague, Dr. Miller, already has brought up the fact, though, that some of these chemicals you mention here might have under certain circumstances different values that you assert they do have. Of course, that might at some future time be a basis for a controversy. Don't you feel we ought to have some way to settle such things—the standards to go by?

Mr. MARKEL. Well, I feel that would be advisable. If I knew the mechanism by which it would be accomplished, I could state from my own opinion whether it would be practicable, whether it would be feasible. The feasibility of these things is what makes them operate. As I say, we are operating in a very intricate field here with an unlimited amount of raw materials.

Mr. HORAN. But you are unwilling to make any suggestions?

Mr. MARKEL. I couldn't make any suggestion that I feel might stand up under the objections, of, say, my colleagues in face creams or the people who manufacture lipsticks or face powders. What might be practicable for me might not be practicable for them. I don't understand their problems.

Mr. HORAN. I want to say this, and I think my colleagues on this committee share this opinion: We would like to do that which would protect the ethical producer of useful things in our society. But unless

the producers themselves have ideas, it is rather difficult for us to even suggest modifications or changes of any law.

Mr. MARKEL. We recognize that, and we are the first to hear of any product that backfires. We have our ear to the ground. We have salesmen in the field, and the supplier salesmen keep coming in our doors in an endless stream, so we hear those things.

Every now and then someone makes a mistake. Basically, they are mistakes in formulas, not mistakes in results which result in injury. The product may separate or the color may fade and not look good. Those are conditions that have come up now and then under specialized circumstances.

Basically it is my opinion that the reputable manufacturer takes those precautions within his own limitations on every product that he puts out. He has a reputation to maintain. He cannot afford to have that kicking around or bandied around or dragged through lawsuits with the resulting publicity.

Mr. HORAN. Just one observation, Mr. Chairman, and then I am through. It has been my experience in studying the work of this committee that all the witnesses from the industry take the same attitude that this witness is taking now, but after it is thought over and after a period of months then industry themselves come forward with suggestions of a very practical nature as to how the law could be wholesomely and properly modified. I trust that you and your association, in your thinking of this matter, may at some future time make a suggestion.

Mr. MARKEL. Of course, we have had almost no advance information on this. I would say we have had a couple of weeks. We are way out here on the coast. The closest center of real manufacturing of cosmetics is Los Angeles. We belong to associations through which we pool our information and suggestions. The course of action you suggested will undoubtedly take place. It always does take place.

People always get their opinions together. But it is very easy for a person to set out a course of what he thinks would be fine legislation, only to have it punctured full of holes by somebody with a different viewpoint. It is just natural.

Mr. JONES. Mr. Kleinfeld.

Mr. KLEINFELD. Is the list of materials which you gave us a complete list of all the materials you employ and have employed in your cosmetic preparations?

Mr. MARKEL. It should be complete. I instructed it be taken right off our formula cards.

Mr. KLEINFELD. As far as you know it is complete?

Mr. MARKEL. Yes, sir; it is complete.

Mr. KLEINFELD. Have you sought for the products which you sell the approval or acceptance of the committee on cosmetics of the American Medical Association?

Mr. MARKEL. No.

Mr. KLEINFELD. Are you familiar with the criteria established by the committee on cosmetics of the American Medical Association with respect to what tests should be conducted on cosmetics before they are used?

Mr. MARKEL. Not specifically, only in a general fashion. I wouldn't care to be quoted on it.

Mr. KLEINFELD. You never examined them?

Mr. MARKEL. I have read them on occasions, but I have never made such a study that I would care to be examined in detail on them.

Mr. KLEINFELD. You don't submit your products for acceptance?

Mr. MARKEL. No; we don't.

Mr. KLEINFELD. What are the cationic agents you mentioned in your list?

Mr. MARKEL. Well, they come under the classification of the Tritons. They are basically cetyls—benzil, dimethyl benzil, ammonium chloride.

Mr. KLEINFELD. What other cationic wetting agents do you use? They are wetting agents, aren't they?

Mr. MARKEL. No; we don't use them as such. They may be classified as surface acting, but a poor type. We don't use them for that purpose.

Mr. KLEINFELD. What function do they serve?

Mr. MARKEL. It has long been known that cationic materials have an affinity for natural fiber such as hair oil wall. Much of the material that is applied to hair is shed like water off a duck's back. You shampoo it out or rinse your hair and it is off. It serves really no useful purpose. It remains strictly on the surface like furniture polish on furniture. But the cationic materials have a definite affinity, they grab. They stay on and leave the hair with a lovely, pleasant, velvety feeling—manageable. The hair is not as prone to be disturbed by the electrostatic effects of combing.

Mr. KLEINFELD. That is not a wetting agent effect?

Mr. MARKEL. We don't use it as such. Well, the Triton is a trade name of Rohm & Haas, and they have all their items under Tritons. There may be 30, 40, or 50 of them, and they are all different from each other.

Mr. KLEINFELD. How about the anionic substances you use? What types are they?

Mr. MARKEL. Mainly sulfated fatty alcohols.

Mr. KLEINFELD. Aren't they wetting agents?

Mr. MARKEL. Yes; they are wetting agents. They are not cationic, and, generally speaking, they are anionics.

Mr. KLEINFELD. One of the committee members mentioned the rather recent occurrence where certain shampoos which were used caused semipermanent blindness in some people who had used them. The indications are that these conditions were caused by the quaternary compounds and some wetting agents.

Mr. MARKEL. Yes.

Mr. KLEINFELD. Well, what tests have you made on these wetting agents to determine that they may not have the same effect?

Mr. MARKEL. The wetting agents?

Mr. KLEINFELD. Yes.

Mr. MARKEL. Well, the manufacturer recommends them for that purpose. Before we ever got into them we had a history of close to 15 years of successful usage. That was one of the points that we wanted to bring out in our letter.

We are not prone to jump feet first into any new product merely because it presents some temporary sales momentum on the market. Occasionally some product comes up and zooms across the retail market like a meteor, and people jump on the bandwagon and they want to put it out. Our company has never been so disposed.

Mr. KLEINFELD. Perhaps you don't understand me. I am asking what tests were made by the manufacturers of these wetting agents, as far as you know? Do they report to you results of the tests they have made?

Mr. MARKEL. No; they don't report to us the tests. But we will receive a bulletin from E. I. du Pont, and they will advise us that the product is satisfactory for use in shampooing human hair. If they didn't make that statement, we wouldn't even bother with it unless we were going to go to a great deal of trouble ourselves. We do occasionally use materials and pioneer new products. In such cases, we go through a long series of tests in our own beauty shops over extended periods of time. By extended periods of time, I mean a year or a year and a half.

Mr. KLEINFELD. So that as far as the ingredients are concerned you rely on the recommendations and advice of the supplier?

Mr. MARKEL. To a great extent we do.

Mr. KLEINFELD. Now even though it may be true that such advice has been received by you and that it may be correct, and even if it is true that a particular ingredient may be harmless, is it not a fact that in connection with other ingredients there may be some possible toxic effects?

Mr. MARKEL. That is correct. We recognize that, of course.

Mr. KLEINFELD. That is, a particular wetting agent may be quite harmless and yet, perhaps combined with a quaternary compound it may cause some cornification of the eye?

Mr. MARKEL. That is correct. It is inherent in the nature of the wetting agent. It is made to promote wetting, promote contacting, and that should be understood in the formulation and compounding.

Mr. KLEINFELD. Therefore, in connection with the products you put out, we have these combinations of ingredients. Have you conducted experimental work on the eyes, let's say, of animals, to determine whether any damage may be done?

Mr. MARKEL. No; but basically we don't have such combinations as suspected in the shampoos which were seized.

I would imagine that the quaternary—laurlyl, isoquinolium bromide—was there perhaps as a dandruff remover or inhibitor.

Mr. KLEINFELD. But unless you actually perform experimental work you just don't know what may happen; isn't that correct?

Mr. MARKEL. Well, but you have a pretty good idea, especially if you have followed the experience of other people over a long period of time, and especially if you follow the recommendations in the journal, and especially if you are not prone to get ahead of yourself in this type of work.

Mr. KLEINFELD. But we know as a fact that only very recently there has been this eye damage caused to people who have used these shampoos.

Mr. MARKEL. I understand what you are driving at, but I also understand what point I am trying to make. If aspirin were invented week before last, the precautions we would take in introducing it into elixir would be considerably greater than present circumstances where we are dealing with any ingredient that has been used in various forms and combinations for three-quarters of a century. That is the point I am trying to bring out. I understand completely what you mean, and agree with it.

Mr. KLEINFELD. I am not sure I understand. There are a large number of wetting agents?

Mr. MARKEL. Hundreds of them.

Mr. KLEINFELD. Some may be good and some may be bad, some may be good when used by themselves and some may be bad when used with other substances?

Mr. MARKEL. Generally speaking.

Mr. KLEINFELD. If a manufacturer is putting out a substance, say, a shampoo, in which is contained a wetting agent and other ingredients, should not a cautious, conservative manufacturer, with a consideration for the welfare of the public and the consumer, make tests on the eyes of animals, and perhaps on humans, to determine whether or not any harm would result?

Mr. MARKEL. If he is introducing a new ingredient, he probably should. If he is introducing one with which he has had no prior experience, that is.

Mr. KLEINFELD. Do you change your formulas from time to time?

Mr. MARKEL. We make modifications in them.

Mr. KLEINFELD. So that a person who may be using your product and finding it quite beneficial and harmless may not know, the following week, what proportions are being used and what consequences may possibly ensue; is that not correct?

Mr. MARKEL. Strictly speaking, there would be no gain-saying what you have mentioned, but as a practical matter I don't think that would be strictly factual.

Mr. KLEINFELD. For example?

Mr. MARKEL. Not in our instance. In our instance, I mean, we don't just take a product and the following day say, "Let's change the whole formula and let's raise the percentage from 15 to 36 percent or from 18 to 25 percent, let's change the pH. from 9 to 11." We make no such changes.

Mr. KLEINFELD. Well, let me give you an instance of something that happened a few years ago. There were lacquer pads being sold, containing a number of ingredients including, I believe, a natural gum which was a fine material, and the product didn't hurt anybody. Of course, there was no statement on the label as to what ingredients were contained in the lacquer pad. Then, without any notice to consumers, without any statement on the label or notice to anybody, a shellac was substituted for the gum and caused severe irritation to a considerable number of women.

Now, how are we going to protect the people against that sort of thing if you don't at least set forth the names of the ingredients on your label?

Mr. MARKEL. Well, protection is one thing, but setting forth the ingredients on the label so far as the cosmetics industry is concerned would afford the consumer little, if actually no protection whatever.

You must remember here you are dealing with women basically, and housewives. You are not dealing with professional people. I refer to products at the retail level. And if you put on your label that it contains shellac or gum copal and formerly you used beeswax or Brazil wax, I don't think it would make one bit of difference to the consumer.

Mr. KLEINFELD. Well at least with respect to the unusual consumer who wants to go to somebody for information as to the possible effect of these things, it would put him in a position to do so.

Mr. MARKEL. He might. He would be in a position to do so. But I think from a practical matter—and I can speak with a little experience in this industry—that that is a distinction without a difference. I don't think you would find one person in millions who would ever make such an attempt or whose knowledge would be improved by it.

Mr. KLEINFELD. Well, is it not true that if a woman has had a disastrous experience with a certain compound containing certain ingredients, she might well be on her guard against using other substances containing the same ingredients if she knew what ingredients were being employed in the cosmetics?

Mr. MARKEL. I think in the last 10 years that I can recall receiving, maybe, two letters from people requesting information of that type—telling us they were allergic to, I believe, oris root or some ingredient used, incorporated in talcum. Those are the only two instances I can ever recall.

Mr. KLEINFELD. Aren't there some ingredients such as synthetic resin which, because of properties inherent in their manufacture, may not be of a constant composition?

Mr. MARKEL. You mean natural resin?

Mr. KLEINFELD. Synthetic resin.

Mr. MARKEL. Well, I wouldn't know.

Mr. KLEINFELD. If that were true, should not a firm which utilizes these products exercise pretty careful chemical and pharmacological control to determine and establish the suitability of each batch of the product?

Mr. MARKEL. Well, I should imagine they should maintain chemical and analytical control. So far as the rest of them, I don't know.

Mr. KLEINFELD. If a synthetic resin may vary from batch to batch, is it not a fact that the only real control may be by the testing of each batch of the resin and of the finished product in which used?

Mr. MARKEL. I don't understand what you mean by the variations. In our own laboratories we endeavor to keep certain of our products within a very narrow range, say, half a percent concentration. We attempt to compensate for variations when we deal with natural products such as viscosity analysis and things of that type. I don't quite understand what you mean when you say that these variations ensue. What types of variations?

Mr. KLEINFELD. Well, you are using a synthetic resin, which may vary from batch to batch. Therefore, you don't know exactly and at all times how this substance is going to react. If that is true, don't you have to exercise a careful control and check of each batch of cosmetics?

Mr. MARKEL. We do.

Mr. KLEINFELD. I am not saying you don't, I am just asking.

Mr. MARKEL. Manufacturers that I have had experience with, and friends who have worked for them, say they always keep accurate records going back many years. Each batch is given a code number and analysis so you can refer back to the manufacturer if anything is wrong or the material doesn't come up to standards. I have had that happen.

Mr. KLEINFELD. Then you believe in exercising pretty careful controls on each batch?

Mr. MARKEL. Oh, definitely so.

Mr. KLEINFELD. That is important?

Mr. MARKEL. Oh, definitely.

Mr. KLEINFELD. Many cosmetics ingredients are manufactured principally for industrial use and are not manufactured primarily for, or even recommended for use in cosmetics. In that situation what is the duty of the cosmetic manufacturer who purchases such a material?

Mr. MARKEL. The duty of the cosmetic manufacturer, before he uses it or after he has developed a formula for it in some one of his products, is to test it to a point where he believes he is safe in placing it upon the market.

Basically your raw materials today aren't made for one specific purpose. A manufacturer discovers in the course of a certain synthesis he develops certain byproducts. He tries to sell them. He tries to develop a market for them. He has his own chemists in his organization scouting the field in an attempt to find new uses and make recommendations for them.

Manufacturers such as ourselves pick them up and see whether the recommendations can be incorporated in our business. And in that way these raw materials spread themselves throughout all industry and textile work and all types of work.

Mr. KLEINFELD. That is all.

Mr. JONES. Do you have anything else you would like to volunteer to give us here that you have not brought out?

Mr. MARKEL. No; I don't think so.

Mr. JONES. We want to thank you, Mr. Markel, for coming here.

Mr. MARKEL. Thank you.

Mr. JONES. Who is your next witness, please?

Mr. KLEINFELD. Dr. Sharp.

(The oath was administered by the chairman.)

Mr. JONES. I notice you include in your statement a thorough identification of yourself, with all of your background. So will you please proceed with your statement?

TESTIMONY OF PAUL F. SHARP, PH. D., DIRECTOR, CALIFORNIA AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF CALIFORNIA, BERKELEY, CALIF.

Dr. SHARP. A little over a hundred years ago, two out of every three people of our country derived their income directly from the land. Today, less than one out of five works on the land and, in California, only about 1 in 10. This change has been brought about by improved practices, such as better varities of crops, use of fertilizer, control of insects, plant diseases, and weeds, and by labor-saving devices. The labor thus released from the farm is used, in turn, to manufacture labor-saving devices as well as many other items for the comfort and pleasure of the people of our Nation as a whole.

In the United States today, 37,000,000 fewer acres are devoted to agriculture than were 50 years ago, and yet our agriculture is feeding twice as many people. Land has been withdrawn from agricultural use for the expansion of cities, construction of highways, and crea-

tion of parks and recreation areas; and has been submerged as a result of the construction of dams and reservoirs.

To the present time three factors account for our ability to feed more people on the reduced amount of land:

(1) The conversion, on the farms, of horses to tractors has resulted in the release of 60,000,000 acres from the production of feed for horses to the production of food for humans. For all practical purposes this conversion is complete, and we can expect no future gains in land from that source.

(2) People are eating much less than formerly, because they are working only about half as hard. The workweek has been reduced from 72 hours or more to 40 hours or less. The work now consists mostly of punching buttons or pulling levers involved in the operation of power machines.

(3) The land is producing more as a result of research in the development of new and improved crops, better cultural practices, use of irrigation and fertilizers, and better control of diseases, insects, and weeds.

The problem that faces us in the future is that of producing still more food for our increasing population from an ever-shrinking amount of agricultural land.

The reduction in daily caloric intake from the high levels cited by Atwater 60 years ago of 7,000 to 8,000 calories for men doing heavy labor common in those days to the present levels of 3,200 to 4,500 will probably not proceed much farther. Our future in feeding the people of the Nation lies along one of two lines: (1) conducting research to improve the production of the remaining agricultural land, or (2) shifting our food habits from secondary to primary products of the soil, i. e., eating the grain ourselves instead of feeding it to the livestock and eating the livestock. This shift from the higher to the lower faulty diet, plus the lower caloric intake, might be disastrous to our national health.

In this country, we have applied our mental resources to accomplishing more with the same expenditure of time and effort. In the beginning, as previously stated, most of our people were engaged in the activity of producing food. As ways and means were developed to multiply the effective use of manpower on the farm, labor was released from agriculture for use in other activities. The labor released from agriculture found employment in the production of articles for our pleasure and convenience, such as better houses, automobiles, refrigerators, radios, television, and electrical devices of all sorts. Without the labor released from agricultural production, as a result of agricultural research, this country could not have been industrialized. Industrialization and the production of food are the keys to our national defense. The release of labor from agriculture and the development of industries occurred simultaneously and progressively, so that at no time was there a serious disorganization of labor utilization.

In general, there has been a continuous demand for increased labor in industries. As our population increases, the prosperity of the country depends upon a continued expansion of industries of all kinds. Any slackening-off of industry always has an adverse effect upon agriculture and the food industry, and starts a trend away from

the more nutritious secondary products of the soil—meat, eggs, milk, fruits, and vegetables—and toward its primary products—potatoes and cereals.

The industrial development of our country depends upon mass production, the development of large manufacturing units requiring elaborate machines and the use of large amounts of mechanical energy. In this way, one set of laborers produces large numbers of manufactured articles at prices that other laborers can afford to pay. In order to accomplish the efficiencies of mass production, a large number of laborers must be gathered together in one area. Urban living thus deprives them of the opportunity to produce their own food. The production of food has become a specialized activity, as is the making of an automobile. The city laborers must be supplied throughout the year with various food products—meat, eggs, milk, fruits, vegetables, and cereals. Therefore, the foods produced in the farming areas must be made available to laborers in city areas on a year-round basis. A vital link in this chain has been the development of transportation, refrigeration, and the food processing and distributing industries.

The various food industries assume the task of getting the food produced on the farms to the cities in as acceptable a form and condition as possible, at a minimum cost with a minimum loss in nutritive value. Insofar as it is practicable they attempt to supply the consumer with a wide variety of foods throughout the year by utilizing such processes as freezing, canning, drying, preserving etc. Thus, the city dwellers, even though removed from areas of agricultural production, are supplied with a greater variety of food products than if they lived on farms and produced their own food.

As a result of the development of both transportation and industrial processing, plus the result of the high incomes paid to labor in industrial centers, people are, in general, better fed today than formerly. This is evidenced by the increased per-capita consumption of foods of high nutritional value, such as meat, eggs, milk, fresh fruits, and vegetables.

Continuous and expanding research along all lines is necessary if we are to keep this economy of ours on the upgrade.

You will admit, I believe, that agriculture and the food industries in general have done a good job of producing food for our expanding population. It is the production of food for the future expanding population that is our main concern. Mistakes made now may seriously affect the future food supply upon which may depend our survival as an independent nation.

As previously pointed out, our gains—by taking the land from the horses and by lowering our caloric intake—are largely behind us. We must produce more on less and less land as time goes on. We can do this only by research on ways and means of producing more on the land and of converting existing land to uses which serve to increase the food supply. Any factor that tends to force us to maintain the status quo should be eliminated. Restrictions cannot help but delay. The question this committee is trying to answer is whether delay is justified, and whether the committee and the Congress should assume responsibility for its disastrous results.

Some of the principal difficulties develop in the field of insect and plant disease control. Insects often acquire resistance to various insecticides, and this problem demands the development of new insecti-

cides. In many instances, these changes in insecticides must be made quickly if crops are to be saved and the people fed. New insect pests and plant diseases are constantly appearing, and suitable control procedures must be developed quickly if the pest is to be controlled and the crops saved. When a control procedure is developed, a delay of even 1 year in obtaining permission for its use might bring ruin to a segment of our agriculture and lower the nutritional level of our population. Unnecessary delays in adopting desirable practices should be avoided and any mechanism creating such delays is certainly not in the public interest.

Let me cite an example of the type of situation that I have in mind. Toward the end of the recent war the armed services inadvertently brought the Oriental fruit fly into the Hawaiian Islands. Within about 3 years one could hardly find a fruit produced on the islands that was not infested with the larva of this fly. Infestation even occurred at the fruit stands where the fruit was exposed for sale. More than 100 varieties of fruits were found to be hosts for this fly; these ranged from coffee berries, and nuts to berries, peaches, apples, pears, and cotton. While the financial loss to the people of Hawaii was serious, it was small in terms of the country as a whole. However, if the fly had gained entrance to continental United States the situation might have been devastating. California produces about $400,000,000 worth of the type of fruits of high nutritional value which are hosts for the fly, not considering some of the vegetables and cotton. Add to this the whole tier of the Southern States, and you can understand that the devastation would be appalling. Imagine what would happen to the agriculture in these areas and to the nutrition of the people if they were unable to get most of the common fruits produced in California and the South. Imagine the situation if Congress by law required some bureau, such as the Food and Drug Administration, to carry out extensive tests covering a period of years before the remedial measures could be applied, based on the very remote possibility that some slight hazard may be involved. If tests covering a long period of time, such as 10 years as implied by Mr. Delaney, are required, by the time the tests were completed the procedure might be obsolete and we would never have available a modern procedure. The consumer always pays all the extra costs. Is it not the case that the known hazard of lowering the nutritional level of the people of our country is much more serious and real than the remote chance that a small amount of residue may be present on some fruit?

During the last 20 years there has been a steady increase in the per capita consumption of fruits and leafy green and yellow vegetables. Nutritionists wholeheartedly agree that this trend is in the direction of improving the health and nutrition of the Nation. The use of fertilizers and pesticidal sprays has been a major factor in obtaining volume production of these items; their use has kept the cost down and yet left a margin of profit for the producer.

If pesticidal sprays were not used many items of high nutritional value would disappear from the market, and the cost of the remaining items would be prohibitive to all but those in the high-income brackets.

Production of specific crops is concentrated in localized areas because volume production is required for the operation of packing and processing plants and the establishment of shipping facilities. This creates

a situation where pests would thrive and spread through the entire production area were it not for the necessary control measures.

Because people now are doing about half as much physical labor as formerly they are consuming about half as much food. This means that the foods consumed should contain about twice the essential minor nutritional factors as formerly in order to supply the body needs. If these essential minor nutritional factors are to come from natural foods, it means that the people should consume perhaps twice as much of the fruits and vegetables and meat products as formerly. This is not being done in many instances and is one of the reasons why nutritionists find deficiencies in our population. This nutritional deficiency is a much more reasonable explanation for armed service rejections than to attribute such rejections to the uses of pesticides on the surface of certain fruits. Therefore the production and consumption of these nutritive foods should be encouraged rather than restricted.

A greater variety of foods is made available to more people over more months in the year at lower costs through the use of pesticides than if pesticides were not used.

The leaders in the agricultural and food industries are opposed to the addition to foods of any material that involves a real potential health hazard, and where such hazards are remotely possible the practice has been stopped.

I have been informed that during the past year in the United States not one authenticated fatality has occurred which could be attributed to the presence of pesticide residues. The odds now seem to be less than 1 in 150,000,000 of such an occurrence. With the moral and legal controls now in operation the chances will probably not increase. This means that the potential hazard of acute effects has for practical purposes reached the vanishing point and is not a problem under our present moral and legal protective procedures. It is difficult, therefore, to see how this would seriously concern the attention of the committee. If there be a hazard, it is more likely to be in the possible chronic effects—that is, the consumption over long periods of time.

We probably know more about the chronic effects of chemicals that may be added to our foods than about many of the chemicals making up our natural foods themselves. The constitution, identity, and most of the properties and effects of the added chemicals are pretty well known. The basic approach of a great number of scientists is one of criticism; that is, attempting to find something wrong with things, and this group is working and will continue to work along this line whether additional laws are passed or not. This group of scientists constitutes our most potent safeguard.

We must remember that foods are mixtures of chemicals, very complex mixtures, in many cases, of perhaps a hundred or more individual chemical substances. It is incidental, insofar as use by the body is concerned, whether the chemicals which constitute our foods come from an animal or vegetable source or are synthesized by chemists.

Nature produces poisonous plants, and yet we do not stop eating plants because of this. We eat some plants that naturally contain chemicals which in themselves are highly poisonous, such as oxalic acid in spinach and rhubarb.

Chemicals are tested for acute toxicity. These tests are performed by feeding the chemicals to test animals at levels usually at 50 to several hundred times the amount that possibly might occur in a food. In use the food in question makes up only a small part of the diet.

It is often assumed that because a chemical may be toxic in large amounts it will be mildly toxic if consumed in small amounts. This is not a valid assumption. Actually, in small amounts, the chemical may be beneficial. If we consumed salt, fats, or water at levels of a hundred times our normal use, investigators would conclude that salt, fat, and water were toxic.

The use of inorganic fertilizers has already been touched upon in these hearings, and more evidence concerning them will be introduced. Suffice it to say that the plant absorbs its food in the form of inorganic ions, and when organic fertilizers are applied these must be converted to inorganic form before the plant can absorb them. If this conversion does not occur the plant will die, even though supplied with the best organic fertilizers known. Rigorous soil tests have failed to show that plants have the ability to absorb their food in organic form. This is true of vitamins.

Mr. HORAN. Would you explain that to me?

Dr. SHARP. The organic fertilizers are very elaborate compounds containing large numbers of elements, including, we will say, nitrogen. They include potassium and phosphorus, some of the major elements. Those have to be broken down into what is called inorganic form, of relative simple chemicals, and the plant takes them up as simple chemicals and not as complicated organic compounds.

Dr. MILLER. Would you then say the boy on the farm should not haul out the manure and put it on the land?

Dr. SHARP. No; that is perfectly all right—as a source of inorganic fertilizer—in the long run.

Dr. MILLER. It is pretty important, is it not?

Dr. SHARP. Pretty important. And it does one other thing which some of the inorganic fertilizers do not do: It improves the texture of the soil, and that is a very valuable thing. Of course, there isn't enough of manure to supply the demand for fertilizers and food production. There is not enough available. We try to use, of course, all that is available, but, roughly, that would account for 10 percent of the real need, or something like that—some small percentage. Plants have the ability to synthesize vitamins from inorganic salts, carbon dioxide, and water; and plant synthesis, plus the synthesis by bacteria, molds, and yeasts, is the source of our natural vitamins.

Natural foods are mixtures of chemicals. Sometimes the food can be improved by increasing the amount of a chemical already present, or perhaps by adding a small amount of a chemical not present. The addition improves the food from one or more of the following standpoints: nutrition, keeping quality, or increasing its acceptability to the consumer. Certain people believe that the addition of a chemical deceives the consumer, makes the food appear to be something that it originally was not, or something that the consumer is not used to. As an example, if the keeping quality of a food product is improved to a point where it keeps longer than the consumer expects, that is considered a deception, in spite of the fact that the net effect may be a lowering of the cost of the food to the consumer. In the end, the

consumer must pay in one way or another for all spoiled food, a fact usually lost sight of. Many of our foods, instead of being defined as entities in themselves, are defined by the method of manufacture; any appreciable change or improvement in method of manufacture therefore becomes illegal by Food and Drug Administration edict.

The only reliable method of determining whether the consumer prefers a product made by an improved method of manufacture is to sell it in competition with the product made by the old method of the definition; but such sale is illegal, so there is no way of getting a valid consumer reaction. Furthermore, most States for uniformity's sake have adopted automatically Federal Food and Drug Administration regulations. Thus, the new product cannot be tested within a single State. Furthermore, if a hearing is held to try to get Food and Drug Administration to change the definition of the food to conform to the improved practice, you are asked for sales volume and evidence of consumer desire. Thus, an impasse is created which stifles improvement and advances in the food field and prevents the lowering of costs. The food consumer must pay more for his foods and be denied worth-while improvements.

As examples of substances that are added to foods, we can take those of disodium phosphate to evaporated milk to prevent curdling during sterilization; sulfuring of dried fruits to prevent darkening; stabilizing gums to ice cream to improve texture; and smoking of meats to preserve. These practices have been approved as a result of long use before the present regulations were in force. Under the present rules, the development of these industries and foods would be practically impossible.

The present procedure for establishing standards for foods is to hold hearings. This procedure appears to be simple and effective; actually, it is far from being the case. Two recent hearings are outstanding examples; the bread hearings and the spray residue hearings. These hearings went on for months. The time involved and the number of staff members present at the hearings cost millions of dollars; the main cost, however, was the preparation for the hearings on the part of the scientific and legal staff. No phase of the agricultural interests and industries concerned dared be absent from hearings because no one knew at what stage a point might arise that, if left unchallenged, might adversely affect an industry, be of detriment to the consumer, or ruin a phase of agriculture.

At the food and drug hearings, testimony by experts from other departments of the Federal Government is conspicuous by its absence, notably from the Department of Agriculture where most of the research on foods under Federal auspices is done. I have been told that one department of the Government is not supposed to present evidence which is contrary to the position taken by another department. Federal tax money is being spent to develop information on foods by the Department of Agriculture and scientists in this department are qualified to present evidence of importance in these hearings, yet advantage is not taken of this information.

I believe that control of foods and food standards should be returned to the Department of Agriculture where most of the work on foods is done and where the information would be available without departmental barriers.

The Government of our country was originally set up on the basis of checks and balances. This basic procedure is breaking down as a result of actions by Congress where power is given to bureaus to function as both judge and prosecuting attorney. This is true of the Labor Department and Food and Drug Administration, to cite examples. An almost similar situation exists in the Patent Office, but in this case appeal may be taken to a civil court.

Food and Drug Administration hearings are held before a member of the food and drug staff, as a presiding judge, with the technical and legal staff of Food and Drug Administration acting as technical experts and attorneys for the prosecution. I do not know who really writes the opinion or makes the decision. Food and Drug Administration personnel probably do the best they can under the circumstances, but I believe the basic principles of this type of hearing are wrong. It seems that the position is taken that the safe procedure is to say no; a responsibility is taken if a yes answer is given. You should consider very seriously before you add another item to this type of control and power.

The Division of Food and Drug is operating under the instruction and authority of acts of Congress. These instructions and this authority are stated in such a way, or the Division of Food and Drug interprets the laws under which they operate in such a way as to retard or prevent utilization of the results of research for the benefit of the public and the agricultural industries of the country.

It seems to me that the committee should consider ways and means of removing the present impasse. One suggestion would be to instruct Food and Drug to grant permission on a tentative basis for the use of new procedures which appear to be desirable in lowering costs, improving the quality of a product from the nutritional standpoint, and increasing acceptability to the consumer. During the tentative approval period, the new development can be evaluated and a decision made in the light of this evaluation as to whether or not final approval should be given.

The comments I have made are not to be taken as critical of the persons in the Food and Drug Administration. These people are approaching the duties assigned to them with a background of experience and an acquired philosophy with respect to the regulatory work, which is considerably different from that of the unfettered investigator. They are doing their best to operate under the laws and regulations applicable to their assigned duties.

I know that the committee is well aware of the small, but extremely vocal, groups of food faddists and sensationalists who make exaggerated claims for or against this or that food product and against some of our widely accepted foods and practices. These people write sensational articles in our papers and magazines. Such articles are replete with innuendoes. They do the American people much harm. It is usually a waste of time and effort to present facts to such people because they will not believe or accept them. Neither do they have facts and proof to back up their beliefs.

I hope the committee will not be swayed too much by the opinion of these people. No one in the agricultural and food industries wants to be responsible for injury to the health of our people. We should bear in mind that the best work in developing our knowledge of the chemicals naturally present in foods, as well as those which may be

present as a result of intentional or incidental addition, is being done in medical schools, departments of biochemistry and agricultural chemistry in our colleges and universities, departments of food and nutrition in the agricultural experiment stations in each State, in the Bureaus of the Department of Agriculture at Washington, such as Foods and Human Nutrition, Entomology, Animal Husbandry, Dairying, and Plant Industry.

My thesis is that some of the present regulations under which the Division of Food and Drug operates should be changed by Congress; and that if you must pass another law, try to avoid stifling the development and improvement of agriculture and the food industry, for as sure as you do stifle development and improvement, you are going to add another item to the cost of the Nation's foods.

(Biography of Paul F. Sharp is as follows:)

Director of the California Agricultural Experiment Station of the University of California, with headquarters at Berkeley.

Education: A. B., Nebraska Wesleyan University, 1917; M. S., University of Minnesota, 1920; Ph. D., University of Minnesota, 1922.

Experience: Instructor in agricultural biochemistry, University of Minnesota, 1920–22, St. Paul, Minn. (research on flour; taught plant biochemistry); assistant and later associate chemist at the Montana Agricultural Experiment Station, 1922–25, Bozeman, Mont. (research on wheat and flour; taught physical chemistry); professor of dairy chemistry, Cornell University, 1925–42, Ithaca, N. Y. (research on dairy products, milk, eggs, and potatoes; taught dairy chemistry and manufactured milk products); director of research with the Golden State Co., Ltd., 1924–48, San Francisco (directed research on milk, and milk products, ice cream, cheese, and cheese products, processing equipment); director of the California Agricultural Experiment Station with headquarters at the University of California in Berkeley, 1949 to date (administrator of State-wide research program in California on all phases of agriculture).

Scientific societies, membership past and present: American Chemical Society, American Dairy Science Association, American Poultry Science Association, Society of Experimental Biology and Medicine, American Association for the Advancement of Science (fellow), Institute of Food Technologists, American Public Health Association, International Association of Milk and Food Sanitarians, American Association of Cereal Chemists.

Honors Chairman of the Cornell section (Ithaca, N. Y.) of the American Chemical Society, 1939; Borden award and medal in dairy manufacturing research, 1941; national president, Institute of Food Technologists, 1950; outstanding achievement award and medal given by the regents of the University of Minnesota to alumni of that institution, 1951; chairman of the Advisory Committee on Dairy Research, appointed by the Secretary of Agriculture; chairman of the group of agricultural experiment station directors of the Western States.

Mr. JONES. Speaking not for the committee but as an individual, Doctor, I would say that I appreciate the practical analysis that you have made of the situation and the recommendations that you have made here in your conclusions.

I do not have any questions. Dr. Hedrick, do you have some questions?

Dr. HEDRICK. How do you feel about the use of human excreta for fertilizer?

Dr. SHARP. The danger there, of course, is the presence in it of some pathogenic organism; if that material were processed in such a way as to make it safe from that standpoint, then I see no reason why it could not be used. As you probably know, in those countries where human excreta is used, the people are subject to certain diseases, and people not used to those diseases don't dare consume certain foods in those areas.

Dr. HEDRICK. I believe it is used in Germany very successfully, though. I noticed they developed unusually healthy plants over there.

Dr. SHARP. I think the plants would be healthy, but we want the people to be healthy, too.

Dr. HEDRICK. The German people usually are pretty healthy folks, you know.

Dr. SHARP. Special care is taken, it is either processed or limited to certain types of foods, or the foods after they are produced are processed to avoid the possibility of carrying pathogenic organisms through.

Dr. HEDRICK. In other words, we are losing billions of dollars a year of valuable fertilizers if it could be used?

Dr. SHARP. We are losing quite a little.

Dr. HEDRICK. That is all.

Mr. JONES. Dr. Miller.

Dr. MILLER. Just adding to what Dr. Hedrick said—of course, the sludge from these plants is usable and quite permissible.

Dr. SHARP. It is used.

Dr. MILLER. But untreated, improperly handled human excreta should never be permitted in this country unless it has been treated.

You have made an excellent statement, and I agree with what you have said, and I think in a long-range program we must look ahead to where we are going to get enough food, not only to feed ourselves but the world. We are taking on a world aspect now, and I believe someone stated not too long ago there is not now enough good farmland to supply enough food to feed all the world under our present methods, all the people that might be hungry. However, I presume you agree that all new wealth comes from the soil or the mines or forests and the sea, and so forth; that if you are going to have a healthy economy you must have a healthy agriculture?

Dr. SHARP. Yes.

Dr. MILLER. I thought maybe you were getting the horse before the cart here on page 2 when you said:

> Any slackening off of industry always has an adverse effect upon agriculture and the food industry, and starts a trend away from the more nutritious secondary products of the soil—meat, eggs, milk, fruits, and vegetables—and toward its primary products—potatoes and cereals.

It is probably true, I believe, the economic records and those in the Agriculture Department show that whenever income from agriculture falls, the income from industry falls. It is agriculture that hurts first. As of now we have a ratio of $1 to $7. One dollar of agricultural income means about seven dollars of income to industry. I think you can go back 5 years in your charts and you will see that that is true.

Today agricultural income is very high, although it has fallen off $4 or $5 million in the last year and has been going down. Personally, I think that is a danger sign. I think whenever you have a lessened agricultural income, that industry is affected, and definitely so because of the lessened income from agricultural products. Do you agree with that statement?

Dr. SHARP. Well, they are both so intimately tied together it is very difficult to say which is cause and effect.

Dr. MILLER. I see.

Dr. SHARP. But, of course, industry was created from agriculture.

Dr. MILLER. That is right.

Dr. SHARP. In that the developments released labor from the farms to make automobiles and things of that sort. And if that had not been the case, we would still have 75 percent of our people on the farms and no automobiles.

Dr. MILLER. That is right.

Dr. SHARP. And it is the result of research and, of course, gaining of new land. We have expanded over that period, moved west, and that has meant new land.

Dr. MILLER. But the wealth first comes from the soil?

Dr. SHARP. That is right. And research has released labor from agriculture that made this other development possible, the new land, the better crops, the research, and things of that sort.

Dr. MILLER. On page 5, at the top, you say:

> I have been informed that during the past year in the United States not one authenticated fatality has occurred which could be attributed to the presence of pesticide residues.

That is probably a proper statement.

On the other hand, I believe there have been deaths from the sprays that have been used, the application of sprays.

Dr. SHARP. Yes, the workers themselves.

Dr. MILLER. Yes.

Dr. SHARP. That is right. Not in terms of consumption of product.

Dr. MILLER. Yes.

Dr. SHARP. Maybe I didn't quite make that clear.

Dr. MILLER. It is a very excellent statement. I would like to keep it and talk to the Farm Bureau when I get home about it.

Mr. JONES. Mr. Horan.

Mr. HORAN. If I understand you correctly, Dr. Sharp, what you are pointing out is the fact that 16 percent of our population of the 150 million people produce all of our food and raw materials.

Dr. SHARP. Yes.

Mr. HORAN. And that they, of course, therefore, are mighty important, and sometimes in devising methods to protect all of us who are 100-percent consumers we might hobble or impair the incentive for the 16 percent.

Dr. SHARP. Yes, that, and we would impair the food that the other 84 percent were getting; because if agriculture cannot produce these really tremendous amounts of leafy green vegetables, meat, eggs, fruits, which the other people consume, then their diet would have to change, and the only direction it could change is to the China and India way.

Mr. HORAN. It is a poor general that does not protect his line of supply, is it not?

Dr. SHARP. That is right.

Mr. HORAN. Of course, we will have that in mind on any modification we may have of existing law. I think it is very important. We do not have any factual data here from the history on the west coast of what litigation and regulation in the line of food and drug under the lights that they had to go by.

I am not being critical of them. They were doing their job we told them to do. I know of cargoes of fruit, at least, that had to go

through analysis and other charges that ran the cost up in carloads as high as $200. There was nothing there for anybody to eat, excepting the bureaucrat that was enforcing the law, and he was getting his pay anyhow. And yet it can only be charged as a menace to the line of supply of the consuming public of the Nation. It is a vital thing and so few people really appreciate how serious it is.

Dr. SHARP. There is no one, of course, who wants to feed this 100 percent of the people any material that has any real hazard. There is no argument on that score. But this sort of thing has gotten a little bit beyond reason, and we have, well, what are commonly called crackpots picking on some of these things—oh, we are poisoning all the people, and statements of that sort. And they don't examine the facts. They get very emotional about it and actually they won't accept facts. It is a difficult situation and we must face it and some way provide for keeping them quiet. I think they are arguing against their own best interests, because if fertilizers and sprays were eliminated, instead of going down to the store and buying an orange, the orange would disappear from their table—and the pear and the apple and all of those things. But they don't quite realize that.

Mr. JONES. Mr. Kleinfeld.

Mr. KLEINFELD. Dr. Sharp, what kind of work did you do in connection with your doctorate?

Dr. SHARP. I worked on the baking quality of flour.

Mr. KLEINFELD. Are you a pharmacologist?

Dr. SHARP. No.

Mr. KLEINFELD. On page three of your statement you say:

> When a control procedure is developed, a delay of even 1 year in obtaining permission for its use might bring ruin to a segment of our agriculture and lower the nutritional level of our population.

Do you know of any instances where the delay of 1 year in obtaining permission for use of a control procedure has ruined agriculture or lowered the nutritional level of our population?

Dr. SHARP. No, but we don't want something set up that would create that delay, and that is what I fear. I cited a threat relative to the Oriental fruitfly which we were so fearful would enter the United States.

Mr. KLEINFELD. But you don't know of any instance where this has happened, do you?

Dr. SHARP. No, because we have been able to go ahead. But if you set up some sort of regulation where a material has to be tested for a certain number of years before it will be approved, we will never have modern approved procedure because we always keep improving the procedures themselves. And if a pest like the Oriental fruitfly should get into the United States and we had to wait 2 years before we cleared the thing to get approval for some control procedure, I have estimated that it might cost California $400 million a year, and it would cost the Southern States probably as much or a greater amount because the fly probably would develop in the Southern States.

Mr. KLEINFELD. And it would lower the nutritional value to the population?

Dr. SHARP. Yes, because you would have no fresh fruits, they would just be off the market. I believe nutritionists are almost unanimous in believing fresh fruits are of high nutritional value and should be in the American diet.

Mr. KLEINFELD. Are you saying that if any particular insecticide was kept off the market for a year the result might be to lower the nutritional value of the health of this country?

Dr. SHARP. Yes, if that insect pest eliminated the food of the American people.

Mr. KLEINFELD. When you say "food" that covers a pretty large area, does it not?

Dr. SHARP. Yes; it does.

Mr. KLEINFELD. Let's take any one vegetable, any one fruit. Let's assume for the sake of argument some bureaucrat didn't approve an insecticide and we didn't get apples for a whole year. Would that lower the nutritional level of the country?

Dr. SHARP. Yes.

Mr. KLEINFELD. Supposing we didn't get peas for a year.

Dr. SHARP. Don't you remember—"An apple a day keeps the doctor away"?

Mr. KLEINFELD. I have heard that. Then it is your opinion that if we didn't get apples for a year our nutritional level would be decreased?

Dr. SHARP. That is right.

Mr. KLEINFELD. Now you say on page 4 of your statement:

> This nutritional deficiency is a much more reasonable explanation for armed service rejections than to attribute such rejections to the uses of pesticides on the surface of certain fruits.

Who has said that the use of pesticides on the surface of certain foods has caused armed service rejections?

Dr. SHARP. Well, there is a statement or an intimation it put a lot of people in the insane asylums.

Mr. KLEINFELD. I am asking you about the statement you make here. Do you know of anybody who has said—I don't know, but maybe you do—that the use of pesticides has caused armed service rejections?

Dr. SHARP. I think probably we could find that. I won't say that I remember specifically.

Mr. KLEINFELD. I wish, if you could, you will inform the committee of the name of any reputable person who has said that, as we would like to have him testify.

Mr. JONES. The way I read it—

> This nutritional deficiency is a much more reasonable explanation for armed service rejections——

Mr. KLEINFELD. There are two statements here. There is an implication that somebody has said that the use of pesticides has caused armed service rejections. Then there is the statement that that is not really so; that it is the nutritional deficiency which caused it.

Let's get to the next point in your statement. You say:

> This nutritional deficiency is a much more reasonable explanation for armed service rejections.

Are you familiar with the literature put out by the Selective Service System as to the cause of rejections of the men for the armed services?

Dr. SHARP. Not in detail.

Mr. KLEINFELD. I have examined the literature, and rejections for nutritional deficiency comprise an infinitestimal percentage of the total of causes for rejection. Are you familiar with that?

Dr. SHARP. No; but I doubt the statement.

Mr. KLEINFELD. You disagree with the Selective Service information?

Dr. SHARP. Yes; because these nutritional deficiencies, very many of them, don't show up by the clinical examination by doctors. That has been shown just recently——

Mr. KLEINFELD. You are not a doctor——

Dr. SHARP. Where doctors have examined large numbers of people, and they could find nothing wrong with them, yet when the proper tests were run for their vitamin level, for example, it was found to be low. And the incidence of dental caries was going up, and things of that sort.

Mr. KLEINFELD. Are you saying that nutritional deficiencies cannot be observed by tests?

Dr. SHARP. Cannot?

Mr. KLEINFELD. Cannot.

Dr. SHARP. They cannot always be observed clinically. It takes the vitamin determination of the blood stream, and so on, to show them up.

Mr. KLEINFELD. Then you think that the Selective Service System and the doctors they used did not perform the proper tests?

Dr. SHARP. I just question it. I haven't seen the report, but I would not accept the general statement.

Mr. KLEINFELD. As a matter of fact, Doctor, in my examination of the literature, the only persons who I have found have made statements that large numbers of people were turned down for the Armed Forces because of nutritional deficiencies were the food faddists and sensationalists whom you mention in your statement.

You say in your statement:

> I know that the committee is well aware of the small but extremely vocal groups of food faddists and sensationalists who make exaggerated claims for or against this or that food product and against some of our widely accepted foods and practices.

Are you familiar with some of the witnesses who have appeared before this committee?

Dr. SHARP. Yes. That is the background for some of that statement.

Mr. KLEINFELD. I see. Then you think that these witnesses who have expressed doubts to this committee as to the safety of various substances and insecticides are in the category of food faddists and sensationalists?

Dr. SHARP. Some of them were, they certainly were.

Mr. KLEINFELD. Let me mention some to you.

The committee had before it Dr. Anton J. Carlson——

Dr. SHARP. Oh, yes, I have read that.

Mr. KLEINFELD. Let me finish my statement, please.

He is professor emeritus of the University of Chicago and apparently has a nationally recognized scientific reputation. Here is what he said, and I quote:

> Sir, it [pretesting of chemicals in foods] is more important than this law regarding drugs, because after all the drugs are a matter of people who are already sick; they may be sick temporarily. The drug should usually be in the hands of experts, doctors, and so forth. But in the case of food that from infancy to the time you die is eaten by all people, I say it is even more important than the regulation about drugs.

Would you classify that as a statement of a sensationalist?

Dr. SHARP. No.

Mr. KLEINFELD. Are you a member of the American Public Health Association?

Dr. SHARP. I was for a time.

Mr. KLEINFELD. Here is what the American Public Health Association has said about this problem:

A consideration of some of the practices in the production and processing of foods shows that there are possible health or nutritional problems involved which are not adequately controlled by methods currently available for the safeguarding of public health. The toxicologic properties of many of the chemicals used in the production and processing of foods are unknown, especially the chronic effects of their long-time consumption in foods.

The American Public Health Association recommend to Congress that it amend the existing Food, Drug, and Cosmetic Act to prevent the incorporation into foods of chemicals or other new ingredients before they have been reviewed and approved by the Food and Drug Administration.

Do you believe that is the statement of a sensationalist?

Dr. SHARP. Well, I think that they should be reviewed and approved, but I still think that they should be reviewed and approved by a more unbiased agency than the Food and Drug Administration, where the Food and Drug Administration had to present their case before some other referee.

Dr. MILLER. Off the record.

(Discussion off the record.)

Mr. KLEINFELD. I think you said, Dr. Sharp, you disapproved of the Food and Drug Administration being what you called the judge and police official; is that right?

Dr. SHARP. Yes.

Mr. KLEINFELD. Are you familiar with the fact that the Meat Inspection Service of the Department of Agriculture has to approve chemicals before they are used in meat products?

Dr. SHARP. Yes.

Mr. KLEINFELD. And if any chemicals are used in meat products which are not approved, the Meat Inspection Service then institutes prosecution; is that not correct?

Dr. SHARP. Yes.

Mr. KLEINFELD. Is that not acting as judge and prosecutor?

Dr. SHARP. Just a little different situation in that the Department of Agriculture has more interest in agricultural production than Food and Drug has.

Mr. KLEINFELD. And the Food and Drug Administration has a greater interest in the protection of the public?

Dr. SHARP. Well, I just question that, because I think they go a little far in their effort to protect the public; they deprive the public from having something which the public really should have.

Mr. KLEINFELD. When do you believe an agency should be judge and police officer and when it should not be?

Dr. SHARP. Well, I think in general that it is a poor principle all the way down the line; and if you want me to agree that the Department of Agriculture might be a little biased, I would agree there; but I do think they have a better chance of rendering an unbiased judgment in that complete assignment of the Department of Agriculture involves two functions—agriculture and food—and more points of

view will be brought to bear upon a problem of this sort than is the case in Food and Drug over in the Federal Security Administration.

Mr. KLEINFELD. And, similarly, are you familiar with the operation of the Insecticide Division of the Department of Agriculture?

Dr. SHARP. Somewhat.

Mr. KLEINFELD. Well, that Division of the Production and Marketing Administration of the Department of Agriculture is charged with the duty of administering the Insecticide Act. If a person wants to put an insecticide on the market, he goes to the Insecticide Division, furnishes his data and his labels, and the Insecticide Division decides whether or not his label claims are correct and whether he has presented sufficient proof of lack of toxicity.

If the Department of Agriculture is satisfied, it may register the product. But if a manufacturer puts on the market an insecticide which has a false label or an insecticide which is toxic, the Department of Agriculture acts as a police official in striking down that product and removing it from the market. That, too, is acting as judge and police official, isn't it?

Dr. SHARP. Yes; but the Department of Entomology, the Bureau of Entomology, is also acting in its capacity with one of its units controlling and preventing the bugs eating the fruits instead of the humans. And so it has another phase of its activity that balances the factors more equitably than if it just had the one assignment.

Mr. KLEINFELD. Well, that is a different bureau acting on behalf of Agriculture; is that right?

Dr. SHARP. Not a different bureau. It is all in the same bureau.

Mr. KLEINFELD. You mean all in the Department of Agriculture?

Dr. SHARP. Well, the Department of Entomology has these two functions: This police function that you describe and also its function as preventing the bugs eating the foods instead of the humans.

Mr. KLEINFELD. No; it is a different division. The Insecticide Division of the Production and Marketing Administration of the Department of Agriculture enforces the Insecticide Act.

Dr. SHARP. No; it is the Bureau of Entomology.

Mr. KLEINFELD. No; it is not. However, if you don't know, let's go on from there.

Dr. SHARP. I would still like to check that.

Mr. KLEINFELD. On page 7 you say, and I quote:

> At the food and drug hearings, testimony by experts from other departments of the Federal Government is conspicuous by its absence, notably from the Department of Agriculture where most of the research on foods under Federal auspices is done. I have been told that one department of the Government is not supposed to present evidence which is contrary to the position taken by another department.

What is the basis for that statement?

Dr. SHARP. Well, it was in connection with the bread hearings.

Mr. KLEINFELD. Yes.

Dr. SHARP. Where a considerable amount of information was available in connection with certain factors in the bread hearings, and that information was not called for by the Food and Drug. In one particular instance, the man that had that information was right in the room during the hearing.

Mr. KLEINFELD. Where you there at the time?

Dr. SHARP. I was there.

Mr. KLEINFELD. Who was this man?

Dr. SHARP. The man was Byron Webb.

Mr. KLEINFELD. Who is he?

Dr. SHARP. He was in the Bureau of Dairy Industry.

Mr. KLEINFELD. Do you know that he testified before this committee?

Dr. SHARP. Yes; I do know he testified before this committee, but not so far as I know in connection with the hearings on establishing the standards for bread.

Mr. KLEINFELD. Did he ask to be called as a witness?

Dr. SHARP. No; he didn't ask. You mean, did Webb?

Mr. KLEINFELD. Did Webb or the Department of Agriculture suggest he be called as a witness?

Dr. SHARP. No.

Mr. KLEINFELD. Do you know whether any Department of Agriculture witnesses testified at the spray residue hearings of the Food and Drug Administration?

Dr. SHARP. I imagine they did.

Mr. KLEINFELD. Then it is not the universal rule, is it, that they don't testify?

Dr. SHARP. No, but they may have been requested to testify because of—well, I had better not finish that sentence.

Mr. KLEINFELD. If you want to finish the sentence, I would be very happy to listen to it.

Dr. SHARP. No.

Mr. KLEINFELD. Are you familiar with the various standards of identity to which you have referred in your statement?

Dr. SHARP. In some respects.

Mr. KLEINFELD. You know there is a criterion established by the Congress that ingredients will be permitted when they will promote honest and fair dealing in the interest of the consumers.

Do you know the many substances which have been permitted use by the Food and Drug Administration in the standards?

Dr. SHARP. I know there are a large number. And after a standard of identity is once established, that is the end of development in that particular industry phase unless another hearing is held.

Mr. KLEINFELD. Are you familiar with the fact that the law provides there may be hearings on proposals to amend standards?

Dr. SHARP. Yes; and I am also aware of the fact that they cost tremendous amounts of money.

Mr. KLEINFELD. Well, as Dr. Miller suggested, how would you change that procedure? Would you do away with hearings?

Dr. SHARP. I would give more latitude in respect to the standards themselves. For example, in the bread hearings, from certain standpoints, that is desirable. It fixes the definition for bread. It prevents, we will say, undesirable, what you might consider undesirable, practices with respect to bread, but it also prohibits improvements in bread, and that is the point that I object to.

Mr. KLEINFELD. Do you believe that the tentative decision of the Food and Drug Administration in keeping out the bread softeners was an erroneous and arbitrary one?

Dr. SHARP. Well, I just really think it was. I noticed in these hearings that is also always brought up. I just wondered if it

wasn't because the Food and Drug really thought maybe they made a mistake.

Mr. KLEINFELD. In doing what?

Dr. SHARP. In prohibiting softeners.

Mr. KLEINFELD. I don't quite understand. The tentative decision of the Food and Drug is to prohibit softeners.

Dr. SHARP. Yes.

Mr. KLEINFELD. I was wondering whether you disagreed with that.

Dr. SHARP. I do.

Mr. JONES. They have never actually exercised that, have they?

Mr. KLEINFELD. The final order is not out.

Mr. JONES. They have never prohibited the use of bread softeners?

Mr. KLEINFELD. No, sir.

Dr. SHARP. I think that decision is not in the best interests of the consumers.

Dr. MILLER. It took how many years—eight or nine—of hearings, before they finally got around to that?

Mr. SHARP. Yes. It started about 1942.

Mr. KLEINFELD. It started before the war, and the hearings were suspended because of the war. Then they went on.

Dr. SHARP. Food and Drug wants to prevent deception, the consumer being deceived. Now it is considered that if a product keeps twice as long as the consumer expects it to keep, then the consumer is deceived. Actually, it is to the benefit of the consumer because it lowers the price of that particular product to the consumer. That is the point often overlooked.

Mr. KLEINFELD. Let's take a couple of concrete examples. Let's assume a person puts out an orange drink containing a very small percentage of orange juice, adds a coloring and makes it appear to the eye of the consumer as orange juice. Would you permit that product to be sold?

Dr. SHARP. The consumer, according to the argument that you were presenting a little before, is perfectly protected by the statement on the label.

Mr. KLEINFELD. I asked you a question. Do you think it should be used?

Dr. SHARP. If properly labeled, and the producer of that product is required to properly label it, then it is up to the consumer to make his decision.

Mr. KLEINFELD. In connection with the bread softeners, which you think the Food and Drug Administration should permit, on June 11, 1951, the National Research Council Consumer Protection Committee said this, and I quote:

> It is our considered opinion that the data available to us on the toxicity, tolerance, metabolic rate, and nutritive value of these surface-active agents proposed for use in ice cream are insufficient to permit a final judgment as to the safety of the substances for use in foods.

Now these surface-active agents are used in bread and other bakery products, meat, and a dozen other substances, for example, ice cream. Do you believe that this Food Protection Committee of the National Research Council is wrong in reaching this conclusion?

Dr. SHARP. I have wondered a little about the scare that is created about the surface wetting agents. There are probably some of them

that should be screened in terms of their chemical constitution, but one of the most effective surface wetting agents is the bile itself, which is an ingredient of every human being, and which is through the intestine a very potent surface wetting agent.

So the fact a thing is a surface wetting agent does not scare me. There may be some surface wetting agents—as you have intimated and brought out, there are hundreds of them—some of them may not and probably should not be used, but others would probably be all right. And to condemn the surface wetting agent as a group just seems to me is going a little too far.

Mr. KLEINFELD. Well, this Food Protection Committee of the National Research Council was considering the data available both on the mono- and di-glycerides and polyoxyethylene monostearate types, and that is the conclusion the committee came to.

Is the fact there may be some natural wetting agents in the body or some natural poison in the food a reason for taking less or more precautions before putting more of such substances in our food supply?

Dr. SHARP. Well, that brings back the point that I tried to bring out before—putting more of those things may be beneficial, it may have no effect, or it may be toxic, and you can't just take the one point of view on that.

Mr. KLEINFELD. You have got to consider each product, don't you?

Dr. SHARP. Got to consider each phase of possible action.

Mr. KLEINFELD. If you have any recommendation to make to the committee, please state it, in the way of legislation or lack of legislation.

Dr. SHARP. I have tried to do that already, intimating that it is not extremely a fair situation to have a group with the same background and philosophy act as both judge and jury.

Dr. MILLER. There have been several suggestions made that a group of scientists and top men in industry, be selected to make the decisions. Would you think that would be a good thing to write into legislation and let them set up their findings, and then the Government be the policeman to carry them out?

Dr. SHARP. Something along that line, I think, would greatly improve the situation, because it would bring a more open-minded consideration to various aspects of the problem, and that is the thing, the key, to correcting these difficulties.

Dr. MILLER. And the findings might be made a little more promptly, do you think.

Dr. SHARP. Yes, I think they might. The Food and Drug is supposed to make a decision on the basis of the evidence presented at the hearings, and they cross-question the witnesses in line with their philosophy. At the Food and Drug hearings there are attorneys from industry to try to balance the questioning a little bit, but the final decision is made by the Food and Drug. I don't know who in the Food and Drug actually makes the decision, whether it is the hearing officer or the man who sits on the other side of the table and argues against you, but probably a combination. But I just think that isn't a good situation with respect to getting a judicial decision.

Another point. I think that the situation could be cleared if some mechanism could be developed for a tentative approval. The methods that the Food and Drug uses for determining whether or not a

chemical is present are usually tentative for 2 or 3 years before they have had enough experience with the methods to adopt them as the final deciding force. The same procedure works in many other cases. So I think we could improve and speed up the situation if somebody were allowed to give a tentative approval and then let everybody follow the procedure, whatever it is, treatment, very carefully, which they would, if it were under tentative approval. Then, after the experience of a year or 2 or 3 years, or whatever time it took, a final decision could be rendered and say, "We will give this final approval," or "We will reject it."

Mr. KLEINFELD. One last question on legislation.

Mr. JONES. All right.

Mr. KLEINFELD. A number of people have suggested the possibility of an advisory council to the Bureau: Do you believe the Food Protection Committee of the National Research Council would be an impartial, unbiased, nongovernmental agency?

Dr. SHARP. I think it could be if it was given, again, sufficient time, and brought all phases into the picture. Now heretofore it has not. Now it is broadening its scope. As a matter of fact, now I am on one phase of that Food Protection Committee of the National Research Council.

Mr. KLEINFELD. Then you think it is an impartial agency, don't you?

Dr. SHARP. I think if all phases were brought into its decisions, it could be, and that has not been the case up until somewhat recently. I am not sure it quite completely represents all phases yet. If that were brought about, then I think that probably would be one of the best agencies for making one of these impartial decisions that we could find.

Mr. KLEINFELD. But the decision which they reached on the surface-active agents, you believe that wasn't well considered?

Dr. SHARP. It was a restricted group that made that decision without considering all aspects of the problem.

Mr. KLEINFELD. What aspects did they not consider?

Dr. SHARP. They didn't consider the aspects of its effect upon the food supply of the country and on agriculture.

Mr. KLEINFELD. I have no further questions.

Mr. JONES. Thank you very much.

Mr. SHARP. Yes.

Mr. JONES. Who is your next witness?

Mr. KLEINFELD. Dr. Hoos. Dr. Hoos has submitted a valuable but long document entitled, "California Food Industries—Their Economic Importance."

Dr. Hoos. I am going to make a statement on that, if you will permit me to.

Mr. KLEINFELD. Fine.

(The oath was administered by the chairman.)

Mr. JONES. I would suggest at the outset that we do not have here anything about your academic background and your experience. So briefly, just state your name, your present occupation, and then your academic background and experience.

TESTIMONY OF SIDNEY HOOS, PH. D., PROFESSOR OF AGRICULTURAL ECONOMICS, AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF CALIFORNIA, BERKELEY, CALIF.

Dr. Hoos. My name is Sidney Hoos. My positions are professor of agricultural economics, economist in the agricultural experiment station, and economist on the Giannini Foundation of Agricultural Economics, University of California.

I received the bachelor of arts degree from the University of Michigan in mathematics in 1934; the master's degree in 1935 in actuarial science and mathematics at the University of Michigan, and in January 1939 I received the doctor of philosophy degree in economics from Stanford University.

After receiving the doctorate I joined the faculty of the University of California until 1941, at which time I was called to Washington and served with the Department of Agriculture 1 year, and with the War Department for approximately 4 years. I returned to the University of California in January 1946, and have been there since.

Mr. JONES. As Mr. Kleinfeld said, we have this long statement here, and I presume that copies of this document "California Food Industries—Their Economic Importance" would be available to persons who were interested. So I am going to suggest, if there is not objection, that the committee retain it in its files.

(The document referred to is in the files of the committee.)

Dr. HOOS. Mr. Chairman and gentlemen, the resolution initiating the current inquiry into chemicals in food products recognizes that the use of chemicals is related to the health and welfare of the Nation and the stability and well-being of our agricultural economy. Your committee has heard testimony relating to the technical aspects, such as phases of agronomy, toxicology, physiology, entomology, and parisitology, nutrition, and biochemistry. Such matters are directly pertinent to the subject of the resolution and merit full consideration. The resolution, however, also refers to—

> the effect * * * upon the stability and well-being of our agricultural economy.

The objective of this statement is to indicate the economic importance of the various agricultural industries engaged in providing food products for our economy. In that manner we shall lay the basis for integrating the stability and well-being of our agricultural economy with the general subject of chemicals in food products. At this point, two qualifying comments are in order. First, we may note that the stability and well-being of the agricultural economy is closely related to the stability and well-being of the general national economy. This is particularly true for the agricultural economy of California. Next, we may note that this statement is limited largely to economic aspects of the agricultural food industries in California. The wide differences in natural conditions, including soils and climate, and the wide diversity in food crops produced in the State, as well as the many different types of food-producing, packing, and processing industries, suggest that many of the questions associated with chemicals in food products are to be found at one place or another in the California food industries.

Characteristics of California agriculture and food industries: Although only about 5 percent of California's population lives on farms, the State is a leader in farm income. California's leading position in agriculture has come about through the development of reclamation and irrigation projects and the application of technological know-how to agricultural production in a highly intensive manner.

The intensive and advanced methods of farming practices have played a role in causing as much as 10 percent of the Nation's farm income from crops and 7.5 percent from livestock and products to go to California farmers. The relative importance of the crops and livestock industries in the State is indicated by the fact that about two-thirds of the California cash farm income comes from field and truck crops and fruit and nuts, and one-third is accounted for by livestock and livestock products.

The State's farm-income position is sensitive to fluctuations in the returns from crops, fruits, and vegetables. In terms of farm value, California produces more than a third of the commercial fruits (fresh and processed use), nearly a fourth of the commercial vegetables (fresh and processed use), and nearly two-thirds of the commercial tree-nut output of the country as a whole. With our large production of fruits and vegetables, there are processing industries which provide over one-half of the Nation's supply of canned fruits, nearly one-fifth of the canned vegetables, and more than 85 percent of the Nation's wine output.

California agriculture and its food-producing industries cover a wide and diversified range of activities. Many of the products are of multiple use; they are harvested and shipped fresh, canned, frozen, dried, and preserved. This means that the State's agricultural economy encompasses highly developed food-processing industries. The diversity of products and the interrelations of supply, demand, and price among the alternative outlets, coupled with long distance from major consuming centers, makes for a complicated economic structure. Marked changes or adjustments in certain parts of the agricultural industry structure make for changes in other parts of the structure and also lead to repercussions on the economy in general.

Trends in farm production and yields: Recognizing the interdependent relations existing within the agricultural industries and between them and the rest of the economy, we may now briefly consider the trends in farm production by some major commodity groupings.

Last year over 6,500,000 acres of field crops were harvested in California to obtain in excess of 15,000,000 tons of products which had a farm value of almost $675,000,000. Compared with the prewar average (1936–40), harvested acreage of field crops had increased about 23 percent, while production had increased over 50 percent. The relatively greater increase of production reflects the improved yields. This tendency for improved yields has resulted from many influences, including better farming practices and management; but recognition must adequately be given to the use of fertilizers, insecticides, pesticides, and similar substances necessary in the obtaining and maintaining of satisfactory yields.

The acreage and production of California truck crops in 1950 were at high levels, with more than 728,000 acres harvested for a production of almost 5,500,000 tons. The total farm value was $338,070,000. In the State's truck crops, on an over-all basis, there has been a rising

trend over the years in both acreage and production. During the past decade, production has advanced considerably more than has harvested acreage, reflecting substantial gains in output per acre. Here, again, the improved yields are in part a resultant of intensive use of pest, insect, and disease controls.

The farm commodities of fruits and nuts are another group of agricultural products which are economically important to California and in which the State is the leader. In 1950 California farmers produced as much as 6⅓ million tons of fruits and nuts from about 1.4 million acres. And this production represented a return to producers of almost $500,000,000. Although bearing acreage of fruits and nuts has increased only relatively slightly during the past several decades, production has tended to follow a trend increasing more than that of acreage. Here, also, as in truck crops and field crops, the relatively greater increase in production has reflected a rising trend in yields.

The above brief comments pertain to the several broad commodity groups. The data are available and we might look at the trends for many individual farm products, but such details are not necessary for our purpose. The evidence is strong and clear that California's complicated but expanding agricultural production industries have experienced increased production, and a relatively significant proportion of the expansion is due to an upward trend in yields per acre farmed and harvested. Those increased yields, in turn, have been influenced by the use of controls over insects, pests, diseases, and similar causes of destruction. Without such controls there would exist greater barriers to the maintenance and expansion of farm production.

Some more economic indicators: Farm production is linked to distribution. The number of business establishments associated with the production and merchandising of food products involves enterprises at the farm level on through the distribution pipeline to the retailer who sells directly to consumers. Although a complete accounting of the number of such firms at the various levels of distribution has not been attempted, data have been developed for particular segments of the production-distribution pipeline.

According to the 1950 Census of Agriculture, in that year there were 137,137 farms in California. In passing it may be noted that California is one of the only three States which had more farms than a decade earlier. About 40 percent of the State's total number of farms are engaged in the production and sale of fruits, nuts, or vegetables.

Once the farm products are produced they must be prepared for market. They may be shipped fresh or processed. Both the fresh shipping and processing industries loom large in the economy of the State.

The packing and shipping of fresh fruits and vegetables is a large-scale operation. Approximately 2,000 fresh fruit and vegetable packers and shippers operate in the State. Some are interested in packing as well as shipping, while others are primarily shippers, brokers, or agents.

Close to 170 packing houses in the State pack and ship fresh peaches, Bartlett pears, or plums. In the important apple-producing area of Sebastopol there are 11 major apple packers; in the Watsonville area, another important apple territory, there are about 20 apple packers. Approximately 17 houses in the State pack fresh apricots. For citrus

there are about 270 packing houses. There are about 65 vegetable packing sheds in the Salinas-Watsonville-Hollister area and in excess of 200 vegetable packing sheds in the State.

Looking at the food processing industries involved in the canning or freezing of California vegetables and deciduous fruits, we find about 200 separate plants representing a current value of about $645,000,000 for land, buildings, and machinery. In addition, there are about 20 citrus processing plants which represents substantial investment. Brief mention may also be made of the many wineries and the various dried fruit plants. All of these packing and processing plants not only purchase their products from farms but also provide employment for thousands of workers.

In recent years total man-hour employment in producing and preparing for market of California fresh fruits and vegetables totaled about 190 million man-hours. The figures pertain to particular segments of the food industries in the State, namely, fruits and vegetables. But when we look at the over-all employment in agriculture, forestry, and fishing, the number of people involved becomes even more impressive. The reported estimated 1950 civilian employment (including wage and salary workers, employers, own-account workers, and unpaid family workers) for the agriculture, forestry, and fishing industries in California rose from a seasonal low of 344,000 in March to a seasonal peak of 516,000 in October.

The employment in the food industries reflects the creation of labor payrolls. Although complete data are not readily available, there is considerable evidence on the payroll-creating activities of the food industries in the State. For fresh fruits and vegetables alone, the payroll for producing, harvesting, hauling to sheds, and in the case of fresh vegetables also field packing in recent years has been in the neighborhood of almost $165,000,000 annually. In addition, there are the payrolls for employment in the fruit and vegetable canning and freezing operations, and they have been estimated to total about $122,000,000 annually for the past year or two. Substantial payrolls also come from citrus processing, dried fruits, and nuts. Hence, for fruits, vegetables, and nuts, total of fresh shipping and processed, the annual employment payroll may conservatively be estimated to be near $200,000,000. In some areas, these industries are the primary economic activities which support the communities, and in other areas these industries are essential if not the only ones.

The California food industries in general rely heavily on out-of-State markets which are spread over the Nation. Transportation, therefore, is a significant feature of our marketing. Transportation also serves as a meaningful example of how employment, income, and service trades are built around and based on our agricultural industries. Railroads, trucking companies, and water transport are involved. For transportation of fresh fruits and vegetables, California shippers pay over $150,000,000 each year. And it must be noted that not included in that total are payments to trucking companies (excepting the fresh citrus figures which include trucking) which transport annually as much as the equivalent of 20,000 carloads of fresh vegetables and melons from California.

As we have noted, the transportation payments just mentioned pertain only to fresh fruits and vegetables. But transportation payments are also made by other food industries in the State. The Cali-

fornia canning and freezing industries last year are estimated to have paid out some $48,000,000 for transportation of raw and finished products with about $6,000,000 for the transportation costs of processed citrus products. Data available indicate that the California fruit and vegetable canners and freezers in 1949 shipped about 1.4 billion pounds by rail for which the railroads received almost $22,000,000 and about 717 million pounds by water for which the intercoastal shipping lines received almost $8,250,000.

The California food industries are economically related in a close manner with many other types of industries. Examples include icing facilities, terminal markets with auction or private-sale facilities, local truckers, distributors, wholesalers, jobbers, retailers, to mention only a few. Another group of related industries is made up of those firms whose business activity depends, in whole or in part, upon purchases of production equipment and services by the California food industries. A few examples include lumber mills, tin-can manufacturers, wood and paper-box factories, farm-equipment firms, food processing and machinery companies, glassmakers, printers of labels, as well as seed and nursery-stock suppliers, among others.

All of these various derivative industries which service California agriculture are contributors to the economic functioning and well-being of many cities and towns in the State; for example, Santa Ana and Covina, among others, are dependent on the citrus industry. In addition, towns such as Hilts, Westwood, Susanville, and others are dependent on their lumber mills which make box shook and boxes used in the shipment of fresh fruit. These are significant examples of how a host of other industries has been developed and built around the food industries in California.

Spread over the agricultural areas of the State among the thousands of acres of fertile land in the delta region, the central valleys, and the coastal area are found operations of the food industries. Many communities and their surrounding areas depend in large part upon the operations of the various food industries. Examples include the south coast and parts of the Los Angeles area, Bakersfield, Fresno, Salinas-Watsonville-Hollister area, San Jose and the East Bay, Modesto, Sacramento and Marysville, among the more prominent. Farmers, workers in the fields, packing sheds, canneries, freezing plants, dairies, and creameries, and tradesmen all participate in a gigantic economic network that comprises the food industries of the State. And many of these food industries depend on customers throughout the country.

It is clear that without the national market the State could not successfully distribute its fresh and canned fruits and vegetables, and nuts; and it is equally clear that without the California production the national market demand would not be satisfied. The existence of the California fruit and vegetable industries at their current levels of operation, both fresh and processed, depends upon the production and sale to out-of-State markets of large quantities of their products. And those food products must be produced, packed, and sold cheaply enough so as to be taken by the distant markets and, yet, yield sufficient returns to farmers, processors, and distributors so that they will continue their operations to satisfy consumption demands.

Production to meet consumer needs: We have indicated some of the major characteristics of California agriculture and have, also,

commented upon the position of the food industries in the State. Their economic importance is clear, and their relations to other industries are now evident. But it is pertinent to note here that there is a direct tie-in between the California food industries and recent trends in food consumption. This is especially relevant for the industries in fruits and vegetables and dairy products.

During the past four or five decades, marked changes have developed in the structure of the diet purchased and consumed by individuals in this country. There has occurred a marked upward trend in the per capita consumption of fruits and vegetables and, also, a rising trend in dairy products. The per capita consumption of fats and oils and eggs has also followed an upward trend, but less marked than that of fruits and vegetables or dairy products. Meats, poultry, and fish have exhibited no apparent long-time trend. But grain products, white potatoes, and sweetpotatoes have tended to follow a somewhat sharp declining trend.

Increased knowledge has been accumulated with reference to nutritionally desirable and actual diets. Advances in the science of human nutrition have occurred along with advances in cultural and production practices, food technology, marketing, and merchandising. Recent studies of consumption practices have enabled students of human nutrition to make comparisons between actual diets and nutritionally desirable diets for various combinations of price and income levels. The results of such studies have pointed to the importance of having adequate proportions of dairy products, citrus fruits and tomatoes, and leafy green and yellow vegetables in the diets of our consumers.

American consumers in general have increased their intake of fruits and vegetables. But the result is still less than the requirements for a nutritionally adequate diet for most people. It has been estimated that large groups of our consumers should substantially increase their consumption of leafy, green, and yellow vegetables and their consumption of citrus fruits and tomatoes. Such requirements, of course, vary among income, regional, age, occupational, and other groupings of consumers; the needs cited refer to a large bulk of the population.

A point of significance here is that some of the food groups for which increased consumer intake is nutritionally desirable are the very food groups in which California food industries are leading producers and distributors. The State ranks high in the production and shipment of fresh and processed vegetables, including tomatoes, and fruits, including citrus. Thus, the structure of the food industries in California is such that it fits in well with prevailing trends in consumption and the nutritionally desirable goals envisaged by human-nutrition experts.

But, in order to produce those food products with increasing efficiency so that they can come within reach of more people and their consumption can be increased by current users, it is necessary to draw upon production and processing techniques which help to maintain and increase yields. It is here that the use of chemicals in food products is pertinent not only to farmers and processors but also to consumers. Without necessary weapons to contain the destruction caused by insects, plant disease, and similar barriers to the maintenance of production yields or their increase, and without processing techniques

which aid in maintaining quality, the interests of both producers and consumers are affected.

As summary and concluding comments, it may be worth while to reiterate the following major points which have been sketched in this statement:

The California agricultural economy and its food industries are a significant part of the general economy of the State.

The California food industries comprise a complicated and widespread network of economic operations. Their economic status affects and is affected by operations in other industries.

The California food industries participate directly and indirectly in the creation and generation of significant amounts of employment and income.

The California food industries have over the years expanded their output and operations. Increased production yields have aided essentially in attaining this expanded production. And the increased yields have in considerable part been associated with more efficient production-processing techniques, including the use of materials to restrain destruction from insects, disease, and similar food-destroying agents.

The California food industries include, as a significant segment, the production and marketing of fresh and processed fruits and vegetables, increased consumption of which is considered to be an important part of nutritionally desirable diet for most American consumers.

These economic aspects of the California food industries are also in substantial part characteristic of the Nation's food industries. And, in food production and processing, the use of materials which help to increase production efficiency without adversely affecting the health of the Nation contribute to the stability and well-being of not only the agricultural economy but also of the national economy.

Thank you, sir.

Mr. JONES. I think that is a very fine statement and brings to the attention of the people the importance of the judicious use of the various chemicals that have contributed so much to the development of the economy, not only in California but the rest of the Nation.

Dr. Hedrick, do you have any questions?

Dr. HEDRICK. How many farms did you say you have in California?

Dr. HOOS. The 1950 census count reports 137,137.

Dr. HEDRICK. How many acres does a farmer have to have before it is classified as a farm?

Dr. HOOS. If I may refer to these figures, on page 25 of this basic document I have summarized not all but some of the major characteristics of California agriculture.

The 1950 census gives 137,137 farms. The 1950 census has not been completed for other characteristics; so, I draw upon the 1945 census.

In total land area we have over 100,000,000 acres. The proportion in farms is a little over a third—34.9 percent.

Land in farms, in acres, is over 35,000,000 acres.

Land in farms, according to use: The cropland harvested was a little over 7½ million acres. The cropland total was over 11,000,000 acres.

The land pastured was almost 24,000,000 acres.

The woodland included 4,000,000 acres.

There are also data on what this investment means in dollars and cents.

Dr. MILLER. You didn't give the number of acres per farm. You don't have that in this statement.

Dr. HOOS. I don't have that in this tabulation, sir. I did not think it pertinent to this investigation. The information can be easily obtained.

Dr. HEDRICK. What would be the smallest plot considered a farm—1 acre?

Dr. HOOS. No. The definition of a farm is decided by the Census Bureau, by a census-determined combination of so many acres and at least a certain value of production.

If I may imply the thought in your question, Are some plots in California so-called large farms? The answer would be "Yes."

Dr. HEDRICK. What would be the average-sized farm in California?

Dr. HOOS. I don't know, but with my pencil I could figure it out.

Dr. HEDRICK. What would be your estimate on it?

Dr. HOOS. It would be a little over a hundred acres, probably. That may be wrong.

Dr. HEDRICK. Do you think it would be that large?

Dr. HOOS. Let me see. Cropland harvested—this is in here. All you have to do is to divide one figure by the other and you will have it.

Dr. HEDRICK. One of these dark, gloomy days in California I will figure that out.

(Discussion off the record.)

Mr. JONES. I think you have compiled a lot of valuable information here, Dr. Hoos, and I am sure the committee will read it with interest. We certainly want to thank you.

Do you have any questions, Mr. Kleinfeld?

Mr. KLEINFELD. No questions.

Mr. JONES. We are about to adjourn here. We will go from here to Los Angeles.

If there is anyone here in the room who would like to contribute his views to this committee, we want you to feel free to correspond with the committee. We will be happy to have any information dealing with the wide subject that we are trying to cover.

The committee will adjourn.

(Whereupon, at 1:40 p. m., the committee adjourned, to reconvene at Los Angeles, Calif., on Friday, November 23, 1951, at 9:30 a. m.)

CHEMICALS IN FOODS AND COSMETICS

FRIDAY, NOVEMBER 23, 1951

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE TO INVESTIGATE THE USE OF
CHEMICALS IN FOODS AND COSMETICS,
Los Angeles, Calif.

The select committee met (pursuant to H. Res. 74 and H. Res. 447, 82d Cong., 1st sess; continuing the investigation and study begun under authority of H. Res. 323, 81st Cong., 2d Sess.) at 9:50 a. m., in room 229, United States Post Office and Court House Building, Los Angeles, Calif., Hon. E. H. Hedrick presiding.

Present: Representatives Hedrick of West Virginia, Jones of Missouri, and McDonough of California.

Also present: Vincent A. Kleinfeld, chief counsel, and Alvin L. Gottlieb, associate counsel.

Dr. HEDRICK. The committee will please come to order.

It is a pleasure to appear in your city to hold hearings. We are very grateful to the chamber of commerce for the courtesies they have extended to us. We like your city, it is beautiful. This is my second trip here and I hope to make another one in the near future.

This committee has no axes to grind, no brief against anyone. The only thing we want to do is to protect the American public, the users of food, and prevent contamination of the food supply as far as we possibly can.

We thank you for being with us and for coming to the hearing.

Who is your first witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Sternberg.

(The oath was administered by the chairman.)

TESTIMONY OF THOMAS H. STERNBERG, M. D., PROFESSOR OF DERMATOLOGY, SCHOOL OF MEDICINE, UNIVERSITY OF CALIFORNIA AT LOS ANGELES, LOS ANGELES, CALIF.

Mr. KLEINFELD. Dr. Sternberg, what position do you hold?

Dr. STERNBERG. I am professor of dermatology at the School of Medicine, University of California at Los Angeles.

Mr. KLEINFELD. Where did you get your medical degree?

Dr. STERNBERG. At Northwestern University.

Mr. KLEINFELD. When?

Dr. STERNBERG. 1934.

Mr. KLEINFELD. And you have practiced medicine since then?

Dr. STERNBERG. Well, I took 3 years' additional training in dermatology at the University of Pennsylvania following that, and spent 4½ years in the Army during the war. Otherwise, I have practiced.

Mr. KLEINFELD. How long have you specialized in dermatology?

Dr. STERNBERG. Since 1935.

Mr. KLEINFELD. Are you a member of any professional societies?

Dr. STERNBERG. Yes.

Mr. KLEINFELD. Which ones, sir? A few of them.

Dr. STERNBERG. The Los Angeles County Medical Association, the California State Medical Association, the American Medical Association, the American Dermatological Association, the Academy of Dermatology and Syphilology, Society of Investigative Dermatology, and about half a dozen others.

Mr. KLEINFELD. Have you written any papers in the field of dermatology for the professional and scientific publications?

Dr. STERNBERG. Yes.

Mr. KLEINFELD. About how many?

Dr. STERNBERG. About 45.

Mr. KLEINFELD. Would you please read your statement?

Dr. STERNBERG. Since cosmetics are chemicals which are applied directly to the skin, it is to be expected that injuries to the skin will result from time to time. Such injuries to the skin are not uncommon in medical practice. While it is not possible to estimate the actual incidence of cosmetic dermatitis or poisoning, it is sufficiently high to warrant preventive consideration.

Since cosmetics are chemicals, they may injure the skin in several different methods. They may be primary irritants, which means that the substance is so manufactured or contains certain chemicals which produce irritation, redness, or vesicules in the majority of users, including people with normal skins. Cosmetics may also contain substances which act as sensitizing agents and, therefore, produce dermatitis of the skin on an allergic basis. All chemicals are capable of producing sensitization reactions, but certain chemicals are known to be more dangerous in this respect.

The most common cosmetics producing allergic eruptions are hair dyes, synthetic perfumes, and nail polishes, although dermatitis may also occur from soaps, rouges, lipsticks, deodorants, and depilatories. Also incriminated at times are numerous hair washes, hair rinses, bleaching agents, face creams, and even face powders.

Recommendations: It is believed desirable that manufacturers of cosmetic products should be held to the same requirements specified by law for drugs and chemicals used for medicinal purposes. Since cosmetics are applied directly to the skin, the safeguarding of the public would require the same toxicity tests required of, for example, a medicinal ointment. Such safeguards are listed as follows:

(*a*) "Closed" patch tests on normal people of the finished product. The patch test should be left in place for 48 hours and readings taken when removed and at 96 hours. Such tests will disclose primary irritants and primary allergies to the substance being tested.

(*b*) Prophetic patch tests as recommended by Schwartz may be of considerable value. In this procedure the 48-hour patch tests are applied to a certain area of the skin and 3 weeks later reapplied to the same area. This may afford some estimation of the sensitizing properties of the preparation being tested.

(*c*) Use tests are probably the most important procedure for reducing incidence of cosmetic allergies. This consists of having a group of normal people use the substance being tested for a period of several months. During this time they should be under the close observation of a competent medical person for any evidence of disease.

(*d*) Any new chemicals being used for cosmetic purposes should first be tested for toxicity in animals and for possible human toxicity. For example, at the present time, many so-called estrogen creams are on the market and available without a physician's prescription. However, it is well known that estrogens are absorbed through the skin and, if the dosage is sufficient, will produce systematic manifestation of overdosage. Also there are many chemicals, such as lead and mercury, which are absorbed through the skin and which can be toxic in humans. These same considerations apply to dyes which may be used in hair preparations, etc.

It must be recognized that no series of tests can be devised which will assure the complete safety of any cosmetic product. On the other hand, preliminary testing will certainly reduce the incidence of harmful effects. The type and extent of tests which might be prescribed by law should be given the careful consideration of qualified medical specialsts and reputable cosmetic manufacturers in joint meetings. Such a conference might well be called by this committee or by request under the auspices of the National Research Council.

Thank you.

Dr. HEDRICK. What is your opinion of estrogenic hormones being used in face creams? Do you believe it to be safe or otherwise?

Dr. STERNBERG. I believe it to be unsafe.

Dr. HEDRICK. For what reason?

Dr. STERNBERG. The reason being that estrogens are very potent hormones which have definite physiological effects on the human body. They are absorbed through the skin. You cannot control dosage in the people who buy these products on the open market. They are not under a physician's observation. They can use any amounts of the creams they desire.

They are sold on the basis that they are going to rejuvenate the skin, sort of a fountain-of-youth idea. Whereas it may be said on the label they are to use only so much, human nature being as it is, people will probably use two or three times as much.

I have seen cases of poisoning by estrogen overdosage from these preparations.

Dr. HEDRICK. Well, does it actually have an effect on the skin? Have you seen any improvement from the use of it?

Dr. STERNBERG. Yes. We have several such preparations on the ethical market available by physicians' prescription which we use in certain skin diseases.

Dr. HEDRICK. What effect does it have on the skin? How does it affect the skin?

Dr. STERNBERG. It has a tendency to reduce ichthyosis, or dryness of the skin, and stimulate the connective tissue and epithelial growth, which is a desirable thing in certain conditions of the skin.

Dr. HEDRICK. In other words, it causes a thickening of the skin?

Dr. STERNBERG. It does tend to cause thickening of the epithelium and naturally irons out some of the wrinkles when that happens, That is correct.

Dr. HEDRICK. What is your opinion about estrogenic hormones causing cancer?

Dr. STERNBERG. That is a debatable subject. It has been stated that estrogens have carcinogenic effects, if applied regularly and over a period of time—I have not seen such a case as far as the skin is concerned.

Dr. HEDRICK. Do you believe it to be rather doubtful?

Dr. STERNBERG. I think doubtful, or, if it does occur, it occurs rarely.

Dr. HEDRICK. Do you have any questions, Congressman Jones?

Mr. JONES. I was interested in the statement here on page three:

> It must be recognized that no series of tests can be devised which will assure the complete safety of any cosmetic product.

But we are to presume, of course, that there are many series of tests which will reveal harmful effects that result from certain cosmetics?

Dr. STERNBERG. That is true.

Mr. JONES. Now when we find from those tests that some people are susceptible to results that are undesirable or where there are harmful effects, what percentage of tolerance would you say we could accept in a product of that kind before it would be safe or desirable to place it upon the market?

Dr. STERNBERG. Ordinarily patch tests are done in a group of 200 people. If, in a cosmetic preparation, you have any positives in that 200, that is too many and the product would be unacceptable. On the other hand, if they are all negative, it doesn't mean that you might not get a positive if you went ahead and expanded that to include, say, 500 or a thousand people.

Now to take one example—nail polish. Nail polish is used by 40 or 50 million women throughout the country constantly. You might test 500 people to the polish and they would be all negative. But even if you only get one reaction in a thousand, when you divide that into 50 million it still constitutes quite a few women who will get a dermatitis from nail polish. So that it is very difficult to say exactly what would be an acceptable percentage of reaction in a cosmetic which is being used for nonmedicinal purposes. In medicine we have these reactions, too; but, since we are treating illness, a certain percentage of reaction is acceptable.

Mr. JONES. What I was getting at was this: I know that there is one well-known hand lotion put out by a reputable firm that has widespread acceptance and which I am sure is all right. Yet, it happens that when my wife uses that particular lotion it causes a rash. Now if she had been one of the 200 who were selected to make the test, on your statement that would have to be ruled out. Am I correct in presuming that?

Dr. STERNBERG. That is my opinion. That is not the law.

Mr. JONES. I know it is not the law, but according to the recommendation that you would make, that would have been ruled out; is that correct?

Dr. STERNBERG. Yes, that is correct.

Mr. JONES. Is it fair for us to presume in selecting, say, 200 people, that if we find one reactor the product should not be used? That is the thing I am thinking about. I base that upon the fact that if I take a penicillin shot I do get such a severe reaction that the doctor advised me never to take another penicillin shot. But still we would not presume to say that penicillin is not safe to use in the hands of a competent physician and that it should be taken off the market because I happen to be a reactor to it. That is the thing that is troubling me—in a lot of these hearings that we are having and the recommendations that are made by some people as to what this rate of

tolerance can be. I think this is a thing to which we should give a lot of consideration.

Dr. STERNBERG. I think you are right. I agree with you. If you will notice in my statement I made no recommendations as to numbers.

Mr. JONES. Yes.

Dr. STERNBERG. I think that is something that should be decided by both reputable cosmetic people and competent medical authorities. Because it is a very important point—what is an acceptable degree of reaction? That is the meat of the whole question, as a matter of fact.

You cannot find any chemicals that won't produce reaction in some people. That is why I started off paragraph 5 with the statement that no series of tests can be devised which will completely eliminate reactions to these cosmetics.

Mr. JONES. But at the same time you did mention the figure of 200 on your patch test.

Dr. STERNBERG. I mentioned that to illustrate a point, namely, the fact that if they were all negative in 200 it doesn't mean that the substance which is being tested might not produce reaction in, say, 1 in 500 or one in a thousand people.

Mr. JONES. But if I understood you correctly, if there was 1 of those 200 which reacted unfavorably, then we are to discard that.

Dr. STERNBERG. Well, I think that's a matter the committee will have to decide. You divide 200 into the number of users, which may be 50 or 60 million, then you can figure out how many reactions you are going to get, and decide whether that is acceptable or not. I am not recommending that 200 be used, nor that 1 in 200 should throw out a product.

Actually, if you carry that on to 500 or a thousand, you might still only have the 1 positive. You can't say you have half of 1 percent reaction merely because you have 1 positive in 200. On a statistical basis that is not valid reasoning. You have to carry that out through a thousand tests or perhaps more.

Mr. JONES. I just wanted to bring out that point and to try to get your opinion on what tolerance should be permitted on that. I know that is one of the things that the committee will have to consider.

Dr. STERNBERG. I think that is the biggest problem with which the committee will be faced.

Dr. HEDRICK. Doctor, there is a large percentage of people that react to quinine, for instance. I don't remember how many. Do you remember?

Dr. STERNBERG. No, sir.

Dr. HEDRICK. Quite a large percentage of people have reaction to quinine. If we tried to exclude everything that had quinine in it from the public, it would certainly be a terrific job, would it not?

Dr. STERNBERG. I wonder if I made myself clear on that issue. I tried to point out, or I want to point out, rather, that there is a difference here between medicines used for the illness and cosmetics used for personal adornment.

Now when we are treating illness, all medicines have a reaction rate without exception. Penicillin is a good example.

Dr. HEDRICK. Yes.

Dr. STERNBERG. Because the reaction rate there is probably as high as 5 percent, and yet penicillin is used as a life-saving drug. We can't give up its use, so we have to accept the possibility of reaction.

The same thing applies to quinine. It is a medicine. There is a reaction rate, but nevertheless its use in medical practice is important enough that we must accept a percentage of reactions. But when you are treating illness, you are willing to accept that, whereas for personal adornment purposes, that is the question with which these hearings are concerned.

Dr. HEDRICK. That is quite right; yes, sir.

Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Sternberg, as the Food and Drug Act now stands, the manufacturer or distributor of a drug product is required to state on his label the names of the active ingredients of his product, and the manufacturer or distributor of a nonstandardized food must state on the label of his product the common or usual names of the ingredients. In your view, should a cosmetic manufacturer or distributor be required to do the same thing—to state on his label the names of the ingredients comprised in his product?

Dr. STERNBERG. I have not given that question any thought, and I am really not prepared to answer it at this time.

Mr. KLEINFELD. Doctor, are you familiar with the statement by the committee on cosmetics of the American Medical Association appearing in the Journal of the American Medical Association of May 28, 1949?

Dr. STERNBERG. I read it at that time, but I haven't seen it since.

Mr. KLEINFELD. I would like to read a few things on patch tests which this committee recommends, and get your views on them.

This committee states, for example, as far as patch tests are concerned, that "200 to 1,000 subjects should be used. The figure 200 is to be regarded as an absolute minimum."

Would you be in general accord with that?

Dr. STERNBERG. Yes, I would.

Mr. KLEINFELD. The committee also says this:

> It may be advisable to have a control experiment with old cosmetics of similar purpose and/or formula, when claims of superiority are offered or when irritation is a possible factor. Use either on alternate series of subjects or on same subjects, dividing body surface (new cosmetics on one side, old cosmetics on other). * * * If no dermatitis occurs in 200 subjects, product is probably safe; if in more than one, product unsafe. If only one case, retest a new series; if one or more cases in new series, product is unsafe.

Are you in general accord with that statement?

Dr. STERNBERG. Yes, that is essentially what we brought out in our discussion a few moments ago; namely that 1 in 200 does not necessarily have any significance. You would have to go on with your testing and expand it and find out whether that 1 percent or one-half of 1 percent here is a true reaction rate, or whether it is less or more.

Mr. KLEINFELD. In other words, if you had 1 adverse reaction in 200 cases you might test another 200 to see if you would get another one?

Dr. STERNBERG. Yes. I don't think you should rule a product out but go ahead and expand your testing.

Mr. KLEINFELD. If the retesting indicated the same percentage of adverse reaction, one-half of 1 percent, would you want to rule it out?

Dr. STERNBERG. In my opinion, yes, because cosmetics are being so widely used. One in 200 doesn't seem like much of a reaction rate to us, but if, for example, in the case of a cosmetic that is used by 50

million women and you divide 200 into 50 million, it represents a large number of reactions.

Mr. KLEINFELD. In other words, although my mathematics may not be good, 1 in 200 appears to be one-half of 1 percent.

Dr. STERNBERG. Yes.

Mr. KLEINFELD. And one-half of 1 percent of, let's say, 40 million people, would be 200,000 people, I suppose.

Dr. STERNBERG. Is it 200,000 or 20,000?

Dr. HEDRICK. I think 20.

Mr. KLEINFELD. One percent would be 400,000 and one-half of 1 percent would be 200,000, which is a lot of women, is it not?

Dr. STERNBERG. That is right.

Mr. KLEINFELD. I have no further questions.

Dr. HEDRICK. Any other questions?

Mr. JONES. One more thing. In other words, when you say rule out a cosmetic now, does that mean you would say because there is any kind of reaction, say, in the case of a face cream or a face powder, if it caused a rash that would disappear after discontinuing its use, that would still be sufficient to rule it out, or would the reaction have to be more serious and have a more persistent nature?

Dr. STERNBERG. Well, that is another question of degree. The ordinary cosmetic dermatitis of an allergic nature will disappear when you eliminate the cause, namely, the cosmetic.

Mr. JONES. Yes.

Dr. STERNBERG. And the severity to a certain extent will depend on how soon the individual or the physician recognizes the cause and stops its use.

Mr. JONES. Let me ask you one question in closing. As a dermatologist, do you find any cases of what we commonly recognize as the product of a reputable manufacturer, whose product has Nation-wide distribution, where that product has caused a reaction which will not disappear after the use of the product has been discontinued?

Dr. STERNBERG. Yes; we occasionally find that. People who have been subjected to an allergen over a period of time may sensitize their skin to the point that they are hyper-reactive to almost everything, and their skin may go on into more or less of a chronic dermatitis, even after the substance is removed that originally caused it. Now that is the exception though, and not the rule.

Mr. JONES. Would the person using that product, would he or she have some advance notice before it reached the chronic stage, that it was causing the trouble and they just would continue to use it regardless?

Dr. STERNBERG. Many people do not recognize the cause of their dermatitis. They are likely not to think of their cosmetics, and they may keep right on using an offending cosmetic, not realizing it has anything to do with their trouble.

Mr. JONES. That is all.

Mr. KLEINFELD. Thank you very much.

Dr. HEDRICK. Who is your next witness?

Mr. KLEINFELD. Dr. Ayres.

(The oath was administered by the chairman.)

TESTIMONY OF SAMUEL AYRES, JR., M. D., LOS ANGELES, CALIF.

Mr. KLEINFELD. Will you state your name and address?

Dr. AYRES. Samuel Ayres, Jr., 2007 Wilshire Boulevard.

Mr. KLEINFELD. Dr. Ayres, what is your academic background, please?

Dr. AYRES. I graduated in medicine at Harvard Medical School in 1919.

Mr. KLEINFELD. Have you practiced medicine since your graduation?

Dr. AYRES. Following internship and graduate training at Massachusetts General Hospital, I came to Los Angeles and have been practicing dermatology in Los Angeles since 1921.

Mr. KLEINFELD. What professional societies are you a member of?

Dr. AYRES. The Los Angeles County Medical Association, the California Medical Association, the American Medical Association, the American Dermatological Association, the Society of Investigative Dermatology, the American Academy of Dermatology, the Pacific Dermatological Association, the Los Angeles Dermatological Association.

Mr. KLEINFELD. Have you contributed papers in the field of dermatology to the professional publications?

Dr. AYRES. Yes; I have.

Mr. KLEINFELD. About how many would you say?

Dr. AYRES. Somewhere in the neighborhood of 30 or 40.

Mr. KLEINFELD. In the course of your practice as a dermatologist, have you come in contact with patients who may have suffered some consequences as a result of the use of cosmetics?

Dr. AYRES. Yes.

Mr. KLEINFELD. Will you please read your statement.

Dr. AYRES. I am very happy to appear before this committee, both on my own behalf and as an official representative of the Los Angeles Dermatological Society with reference to the pretesting of cosmetics before they are marketed in order to establish their harmlessness. In all probability, the great majority of cosmetic manufacturers are conscious of their responsibility to the public and conduct adequate tests to insure the harmlessness of their product. This is not always so, however.

Within the last 2 or 3 years, I have personally encountered perhaps 15 or 20 cases of injuries to the fingernails resulting from the use of so-called base-coats which were applied in beauty shops prior to the application of nail polish, with the idea of causing the nail polish to adhere more firmly. My own experience with this condition has been shared by other dermatologists throughout the country . A considerable number of cases of injury to the nails has been encountered from the use of this particular product, in which hemorrhages have appeared beneath the nails, often accompanied by considerable discomfort and separation of the nails from the nail bed, requiring a number of months for the injured nails to grow out so that a normal appearance would be returned.

A more serious incident of the injurious effect of cosmetics occurred approximately 10 or 15 years ago when a product marketed under the name of Koremlu Cream was found to produce toxic effects. I have not personally encountered instances of harm from this par-

ticular preparation, but I have talked with other dermatologists who have encountered such cases. The product was sold for the purpose of removing superfluous hair under the arms, et cetera, in other words, a depilatory. It contained thallium acetate. Thallium acetate has been used in the past by physicians for internal administration to produce temporary loss of hair in cases of scalp ringworm in children. It is a matter of common knowledge that the drug is toxic, and the dose must be very carefully regulated to avoid toxic reactions. In fact, its use has been practically discontinued, at least in this country, because of the possibility of serious injury. In spite of the fact that this toxicity was a matter of record, this particular depilatory cream was advertised widely in the newspapers and sold to the public in some of our large department stores in Los Angeles, as well as in other parts of the country. An indiscriminate application of this preparation to the skin can result in a considerable degree of absorption of the poisonous substance, thallium acetate, and a number of cases of blindness, paralysis, and other nerve injuries, including death, resulted from its indiscriminate use.

A number of years ago serious eye injuries were reported following the use of a certain type of eyelash dye. The current use of hormones in creams is something which perhaps also should receive some attention. Hormones are potent substances and their indiscriminate use could cause injurious effects under certain circumstances.

Inasmuch as substances applied to the skin can be absorbed and thus produce systemic effects, it is highly desirable that adequate safeguards be required before such preparations are sold to the public.

As to the nature of these safeguards, this is a question which should probably receive considerable study and it would probably be desirable to have a committee of recognized dermatologists from various parts of the country examine all of the available evidence and recommend suitable precautions. It is not always possible to completely exclude the likelihood of injurious effects of certain substances in spite of the safeguards, but the incidence of such injuries will certainly be much greater if proper safeguards are not employed.

Such safeguards should probably include patch tests carried out on a sufficiently large series of cases to be of some significance, probably not fewer than 500 cases. This would at least exclude the likelihood that the substance in question was a primary irritant. Also, it would probably be desirable to repeat patch tests on the same individuals after an interval of some weeks to determine whether these individuals had become sensitized as a result of the preceding application.

In the third place, it would be desirable to carry out a "use test" which would involve at least 500 to 1,000 individuals and would consist of having them use the product for a period of 5 or 6 months, applying it as it would be expected to be used under average conditions.

Finally, it would be desirable to carry out a series of animal experiments when indicated to exclude the possibility of systemic injuries by absorption from chemicals, hormones, et cetera, contained in the cosmetic.

The suggestions contained herein represent the general feeling of the Los Angeles Dermatological Society.

I trust that these few remarks will be of some assistance to you in this rather important matter.

Thank you.

Dr. HEDRICK. Doctor, do you believe that estrogenic hormones might cause cancer?

Dr. AYRES. I think there have been instances reported of animal experiments in which continued use of sex hormones in certain amounts are capable of producing malignant change.

Dr. HEDRICK. Yes.

Dr. AYRES. And I think—well, for instance, the physiological effects of using hormones produce tenderness of breasts in women, for instance, and if there were a latent malignancy present, it is quite conceivable this increased activity might stimulate such malignancy to active growth.

I don't think the danger is great, but I think it depends a good deal on the susceptibility of the individual and the amount of hormones used in a length of time. In other words, I think the use of hormones is a proper thing when it is needed to correct some definite physiological condition, but not to use indiscriminately.

Dr. HEDRICK. You think it should only be used on prescription; is that correct?

Dr. AYRES. I think it is a proper thing in the present state of our knowledge. We have not too much knowledge. Maybe 5, 10, 25 years from now we may find it is perfectly safe to use hormones just by purchase from the drug store, but I think at the present time we are not sure that is so, and I think there is some evidence it isn't so.

Dr. HEDRICK. What is the usual amount of international units per ounce in these face creams?

Dr. AYRES. I haven't any idea.

Dr. HEDRICK. What percentage would be absorbed in your opinion that would be used?

Dr. AYRES. I think the greater part of it would be absorbed. If you rub any kind of a grease into the skin which contains medication, that medication is absorbed to a considerable degree. For instance, the early treatment of syphilis consisted of the use of inunction of mercury in grease. That was the only treatment they had for syphilis in the early days, plus oral administration, and much good resulted. In fact, you could get sufficient absorption of mercury simply by rubbing into the skin so you got poisoning from mercury with injury to gums, stomach, kidneys.

Dr. HEDRICK. You got dermatitis from it too, frequently, did you not?

Dr. AYRES. Yes, you did.

Dr. HEDRICK. I well remember that. I remember that they used to put mercury in their shoes, and they walked on it day in and day out.

Dr. AYRES. Yes.

Dr. HEDRICK. And plenty of people got sore feet, between their toes.

Dr. AYRES. That is right.

Dr. HEDRICK. I have been told—I don't know whether it is correct or not—that only about 25 percent of estrogenic hormone would be absorbed through the skin in any one application.

Dr. AYRES. Well, I think it depends on how much is rubbed in. If it is just smeared on, perhaps very little would be absorbed; if it is rubbed in until the cream disappears, I think it would be almost 100 percent absorbed. It has got to go somewhere.

Dr. HEDRICK. Of course, the average person is not going to rub it in too long. Probably 5 or 10 minutes would be the longest.

Dr. AYRES. If rubbed until it disappears, it is in the skin, and then it can be absorbed by the lymphatics just as though taken by mouth.

Dr. HEDRICK. What is the basis of many of these face creams? Do you know what they use as a base?

Dr. AYRES. I think some of them use lanolin, and then there are many new synthetic bases, including the so-called higher alcohols, such as cetyl, and so forth, in various new preparations that are used. Petrolatum, vaseline, is sometimes used, not too much nowadays.

Dr. HEDRICK. I believe you said you graduated in 1919.

Dr. AYRES. February 1919.

Dr. HEDRICK. I graduated from medical school in 1917. In those days lanolin was about the only thing we believed went through the human skin. Once in a while somebody said turpentine would penetrate the human skin. In those days, it was almost impossible to imagine that ordinary medicines would go through the human skin.

Dr. AYRES. A great many new synthetic bases are used.

Dr. HEDRICK. Yes, that is true.

Any questions, Mr. Jones?

Mr. JONES. No questions.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. Doctor, in your experience with these cosmetics, do you find that the reliable, well-established cosmetic manufacturer is careful with the materials that he puts into his creams and lotions before he delivers it to the public?

Dr. AYRES. I don't know what care he exercises, but I think it is probably so by reason of the fact that we don't encounter very many instances of reactions from many of these reputable preparations. Yet, on the other hand, it depends on what you call well-established, reputable firms. Many of them, or some of them that pass for that are putting out hormone creams. I don't know what the name of the firm was which manufactured this thallium acetate depilatory cream, but if they did 10 or 15 years ago, there is nothing to prevent somebody from getting some bright idea of putting something else in cream tomorrow or next week.

Mr. MCDONOUGH. Is that being used at the present time?

Dr. AYRES. It was taken off the market a number of years ago.

Mr. MCDONOUGH. Off the market?

Dr. AYRES. Yes.

Mr. MCDONOUGH. The reason I say a reliable firm, I imagine if they use anything detrimental or deleterious to the person who buys it, the public soon catches up to them.

Dr. AYRES. That is right.

Mr. MCDONOUGH. And that leaves a bad impression of the firm in the minds of the public.

Dr. AYRES. That is right.

Mr. MCDONOUGH. This committee, as you understand, is looking into these matters for the purpose of recommending legislation to the Congress.

Dr. AYRES. That is right.

Mr. MCDONOUGH. And we are asking you expert people that are in the business what kind of legislation we ought to recommend.

We have heard from a lot of people in different parts of the country. Now what is your opinion? Do you think anything should be added to the Food, Drug, and Cosmetic Act in order to protect the public against materials that may be detrimental to the users?

Dr. AYRES. I would repeat a statement that was in here—that the general consensus of the opinion at the last meeting of the Los Angeles Dermatological Society, when this whole matter was discussed, was there should be a conference of representative dermatologists from various parts of the country particularly to go into the evidence that has been brought up heretofore and make recommendations.

In other words, we didn't feel that we were qualified to make final recommendations other than the ones that were suggested here, which were felt to be rather minimum safeguards, namely, patch-testing on a sufficiently large number of people to demonstrate primary irritants, and then repeat patch tests to pick up sensitizations because some things sensitize people more easily than others. And then use tests in sufficiently large numbers of people and over sufficient lengths of time to show what the ordinary use would do. Then, finally, animal experiments to pick up any poisons like thallium acetate.

Mr. MCDONOUGH. You mean that procedure should be followed before a new chemical is added to a cosmetic for general use by the public? Is that what you are saying?

Dr. AYRES. Yes, I would say so.

Mr. MCDONOUGH. How would you choose this council of dermatologists and medical doctors and others that might be called in on a matter of that kind? Where would you pick them from? Where would they sit and what authority would they have?

Dr. AYRES. Well, I think you could get a fairly good idea by selecting men connected with teaching institutions and members of——

Mr. MCDONOUGH. Recognized——

Dr. AYRES. Recognized dermatologists.

Mr. MCDONOUGH. In the business?

Dr. AYRES. That is right.

Mr. MCDONOUGH. That same thing has been suggested at previous hearings on the addition of new chemicals in food processing.

Dr. AYRES. Yes.

Dr. HEDRICK. Will you yield there a minute?

Mr. MCDONOUGH. Yes.

Dr. HEDRICK. Don't you believe that the manufacturer should be represented in this thing?

Dr. AYRES. Yes, I think so. I think that would be a good idea.

Dr. HEDRICK. In other words, some physician that is connected with some of these big firms should be on that council?

Dr. AYRES. I think it would be the proper thing.

Dr. HEDRICK. Otherwise it might be considered one-sided?

Dr. AYRES. That is right. I think that would be proper.

Mr. MCDONOUGH. Of course, we get into a very questionable policy here when we go into this. Now, I like the idea of a council.

Dr. AYRES. Yes.

Mr. McDONOUGH. There is the question of how long the manufacturer has to wait for the council to make a decision on the use of a certain new chemical and whether it should be determined on the lifetime of an animal or partial lifetime of a human being. Then, of course, even after you have thoroughly analyzed the whole thing, the council comes to a conclusion and the product is offered to the public, you still can't—I am asking your opinion on this—determine that it will not be detrimental to all people? Some people are more sensitive than others.

Dr. AYRES. That is certainly true. You can't name a substance that some individuals may not show a reaction to.

I had one patient sensitive to brown wrapping paper. You can't mention anything that someone is not allergic to.

Mr. McDONOUGH. In what way?

Dr. AYRES. Carrying packages on the arm and going to the grocery store and carrying packages on the bend of the arm. Strongly positive patch tests, with blistering reaction to the particular brand of wrapping paper.

Mr. McDONOUGH. Yes.

Dr. AYRES. While that would happen to one out of several millions of people or less, quite frequently other things might react one out of every few thousand or something.

Mr. McDONOUGH. Do you think that cosmetic manufacturers claim in their advertisements more than their products will perform?

Dr. AYRES. I certainly do.

Mr. McDONOUGH. You do?

Dr. AYRES. Yes. [Laughter.]

Mr. McDONOUGH. I don't know of anything outside of automobile advertising that claims as much. Now, when they claim these things, it is generally considered they will have that effect on people who buy them.

Dr. AYRES. That is the general implication you receive from reading the advertising.

Mr. McDONOUGH. Do you think this board that you are speaking about should look into the possibility of how authentic their claims are, or should the Federal Trade Commission come into the picture on that?

Dr. AYRES. I think they certainly should; I certainly do. Because claims are made that absolutely can't be lived up to. It is easy enough for a person to spend $5 a jar for a certain cream, try it out for a couple of months, and then discard it. I mean it will take longer than that sometimes before they discover it isn't working.

I think there is a great ballyhoo about a lot of cosmetics that are supposed to rejuvenate the skin. Of course, no man or woman wants to grow old and see fine lines appear. They naturally want to get rid of them. The most that can be done is to lubricate and soften, wash, and keep clean with soap and water. And when that is said, you have said what cosmetics can accomplish in taking care of the skin. That is my opinion, and would represent the opinion of most dermatologists.

Mr. McDONOUGH. Palm oil was the basis of Cleopatra's beauty: was it not?

Dr. AYRES. I think so.

Dr. HEDRICK. Mr. Kleinfeld?

Mr. KLEINFELD. You mentioned the case of your patient who found she was sensitive to wrapping paper.

Dr. AYRES. That is right.

Mr. KLEINFELD. I assume you told her to keep away from wrapping paper?

Dr. AYRES. That is right.

Mr. KLEINFELD. Assume that a woman uses a cosmetic and gets some adverse reaction.

Dr. AYRES. Yes.

Mr. KLEINFELD. As the law stands now she doesn't know what is in that cosmetic.

Dr. AYRES. That is right.

Mr. KLEINFELD. The label doesn't set forth the ingredients.

Dr. AYRES. That is right.

Mr. KLEINFELD. So in searching for some other cosmetic which does not contain the ingredient to which she may be sensitive, under the present law she has no way of knowing whether or not this new cosmetic contains that ingredient. In view of this, do you think it is advisable for labels to state the names of the ingredients?

Dr. AYRES. I think it is as important for labels of cosmetics to state the names of ingredients as it is for labels of drugs. Otherwise, the only recourse such an individual would have would be to spend good money to make a patch test of every new cosmetic product she used.

Mr. KLEINFELD. That is not easy; is it?

Dr. AYRES. Not too easy, no.

Mr. KLEINFELD. No further questions.

Dr. AYRES. Answering one specific point, I recall a patient strongly sensitive to tincture of benzoin. She sprained her ankle and a surgeon strapped adhesive tape on it and took the precautions of painting it with benzoin before putting the adhesive on. It is supposed to prevent adhesive tape sensitivity. It was left on for 4 or 5 days, and she had severe vascular eruption. A patch test found her sensitive to benzoin rather than adhesive tape. She had developed a peculiar type of sensitivity with secondary allergic spreading and required several months to heal.

I did not see her again until about a year later when she came in with her face swollen like a balloon, and when quizzed again regarding cosmetics, I found she had used a skin freshener, and upon inquiry found it contained benzoin. Had she known that in the first place, she would not have used it, or would have been advised not to use it, at least. That would be a very practical example of what you are bringing up.

Mr. KLEINFELD. Yes.

Dr. HEDRICK. Thank you very much, Doctor, for your time.

Dr. AYRES. Thank you.

Dr. HEDRICK. Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Pottenger.

(The oath was administered by the chairman.)

Mr. KLEINFELD. Since the doctor's statement contains his qualifications, I suggest he just read the statement.

Dr. HEDRICK. Yes, that is all right.

TESTIMONY OF FRANCIS MARION POTTENGER, JR., M. D., MONROVIA, CALIF.

Dr. POTTENGER. My name is Francis Marion Pottenger, Jr., of 609 North Canyon Boulevard. I am a physician, practicing in the city of Monrovia, Calif. I received my grammar and high-school training in private and public schools in the State of California. In 1925 I graduated from Otterbein College in Westerville, Ohio, with the degree of bachelor of arts. In 1930 I graduated from the University of Cincinnati, with the degree of doctor of medicine. I served as intern at the Los Angeles County Hospital and residency in tuberculosis at Pottenger Sanatorium in Monrovia. My practice subsequent to this has dealt largely with developmental problems in children, and nutrition in general. I am, at the present time, secretary of the Los Angeles County Medical Commission for the Study of Environmental Contaminants. I have made extensive studies of the heat processing of food on experimental animals. I am an assistant professor, experimental medicine, at the University of Southern California.

My interest in the problem of pesticides can best be given to you by a résumé of my findings.

When the young men who had previously been my patients began to be mustered out of the services in 1945, I noticed that quite a percentage of them showed a great lassitude and some showed a mild icterus, or yellow color to the white of the eyes and skin. Much of this had been masked while they were in the service by atabrine as an antidote for malaria. Many were nervous and exhausted and showed a prolonged period of psychic disturbance, complained of chronic cough and weakness. Some showed disturbances in the skin.

I had no proof of the exact cause of this illness, but there was evidence that the cause of it was hepatotoxic, or that liver damage had occurred in most of these boys who were so exhausted.

Mr. MCDONOUGH. That is jaundice you are speaking about; is it not?

Dr. POTTENGER. Yes, sir; mild jaundice.

Shortly after the close of the war, DDT bombs became very prominent and DDT began to be used generally by the public. I noted that some of my patients showed similar phenomena to those shown by the ex-servicemen. The first proof, or the first concrete evidence, that I had of DDT poisoning occurred in a public health nurse who was given DDT bombs to spray the premises of her patients. She was called in to see a Mexican family who had a small enclosed room, and inasmuch as it was assumed to be contaminated with vermin, she followed the instructions and thoroughly sprayed the room. Immediately, she suffered a rapid heartbeat, pain in the region of the heart, great fatigue, and extreme apprehension. It was necessary for her to rest a considerable length of time before she was able to drive home. However, her symptoms of precordial pain—that is, pain in front of the heart—and rapid heart remained for several days. This was followed approximately 2 weeks later by a so-called attack of virus pneumonia.

Following this, I saw more and more patients who, I felt, had had ill effects from the use of pesticides and we began to find a relation-

ship between certain gastrointestinal episodes that were frequently followed in approximately 10 days to 2 weeks by respiratory episodes, sometimes of the type that we have been calling virus bronchitis.

In some of the instances, certain fruits and vegetables were definitely suspected. Samples of these were obtained and sent to the Bureau of Chemistry of the State of California, with the report received that they did contain pesticides but that they were within the legal limit. The gross offenders among these fruits were apples and pears.

We began to notice that in patients who had symptoms of poisoning certain very common things occurred. First, there was a yellowness of the skin and bronzing around the eyes—evidence that there was a disturbance in these individuals—and a creamy icterus or yellowness of the eyeballs was noted. This usually followed so-called virus intestinal upsets. We found that in these patients very shortly there was an increase in the amount of bile in the blood, which is measured by what we call, technically, icteric index. The increase in the icteric index was not great, although we have seen, in severe cases of poisoning, relatively high figures. On the scale which is used by the clinical pathologist, whose normal variation is from 4 to 6, we usually see from 8 to 10, although I have seen as high as 30.

Occasionally a patient who has ingested pesticides will suffer from an acute gastrointestinal episode. This is followed by bronzing about the eyes, icterus of the sclerae, and an increase in the icteric index. Frequently, there is a secondary episode in 10 days to 2 weeks. At this time the blood cholesterol begins to rise and may continue to rise for several weeks. These secondary effects are frequently followed by prolonged exhaustion.

After becoming acquainted with the work of Dr. Lehman and others in the field, I made arrangements with the United States Food and Drug Administration, Washington, D. C., to run some samples of fat of some of my patients suspected of pesticide poisoning. Our findings varied from no detectable amount to as high as 33 p. p. m. In running fats from patients who came to autopsy, specimens being provided by Dr. A. G. Foord, pathologist of the Huntington Memorial Hospital in Pasadena, a similar range of concentration was found in the fat of individuals who died from causes unrelated to pesticide poisoning. However, a large percentage of these, to be reported on by my associate, Dr. Bernard Krohn in his prepared statement, showed evidence of liver damage.

It is true that severe illness causes liver damage, but the question arises, Did the presence of chlorinated hydrocarbon pesticides, determined as DDT, in their fat contribute to the death of these people?

There is another point which we have found in our work. Various individuals vary greatly in their susceptibility to pesticide poisoning. We are all familiar with the fact that there is the man who can consume his fifth of whisky a day, year in and year out, without evidence of ill effect, and yet there is the other man who suffers from taking as small an amount as one cocktail. In our experience, we have found that individuals with little fat and a high metabolic rate, who eat well and live in the open, suffer relatively little from exposure to pesticides. On the other hand, the individual who has lesser metabolic drive is more prone to damage. Women who have had hysterectomy appear to be highly susceptible.

Mr. Chairman, I have reported to you only the high lights of my personal experience with DDT and its analogs. I have other clinical evidence suggesting that parathion and tetraethylpyrophosphate and materials of similar character may likewise be injurious not only to the ultimate consumer but to those who reside in the neighborhood where they are used. With the present trend to devise pesticides that can be translocated from the soil to the plant, it appears quite possible that other serious problems may arise, particularly if all of the material is not metabolized before the plant reaches the market. Any compound possessing substances which may be lethal under any circumstance, or which may lead to chronic illness, should be thoroughly reported to the consuming public. Foods that are sprayed during the process of growing, preparation for the market, or during the handling for final distribution should contain warnings so that the public is at least made aware of the fact and can choose for itself whether it wishes to take the risk.

Dr. HEDRICK. Doctor, in your opinion is there any connection between DDT and virus infection?

Dr. POTTENGER. I believe certain of the effects of DDT poisoning are similar to the so-called virus pneumonias and the virus gastrointestinal tract infections we are seeing at the present time.

Dr. HEDRICK. You wouldn't go so far as to say that DDT would cause virus pneumonia; would you?

Dr. POTTENGER. It is a very difficult thing to prove whether DDT would predispose the individual to susceptibility to the agents that will cause the pneumonia which we call virus pneumonia.

Dr. HEDRICK. We had a witness before this committee in Washington, who is thoroughly sold on the theory that virus pneumonia is caused by DDT. I think that witness is conscientious in his beliefs, and he has done a lot of work on it.

Dr. POTTENGER. I don't think there is any question that there are some pneumonitis like the pneumonia of the nurse I mentioned in which a definite pneumonitis can be caused by an aerosol bomb.

Dr. HEDRICK. It should be investigated further; don't you think?

Dr. POTTENGER. I believe so; yes.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. Do I understand from your concluding statement you are recommending that any foods that have been sprayed in the process of growing, preparation for market, or the final handling should carry a label or something to that effect?

Dr. POTTENGER. I feel that they should, yes; very definitely.

Mr. JONES. You mentioned here about the apples and pears, the gross offenders, speaking of spraying. Do you think that is caused by either the failure to exercise proper care in the washing of that fruit, or do you think that there is an absorption or a penetration of the skin of those particular fruits by the pesticides that are used?

Dr. POTTENGER. I think the pesticide enters the fruit in two ways. The first spraying of the apple, as I understand it, is during the period of blossom.

Mr. JONES. Yes.

Dr. POTTENGER. And the blossom is incorporated on the inside of the apple forming the core in which the developing seed grows. DDT, arsenic, and other substances can be carried in it.

Mr. JONES. That is what I wanted to find out.

Now, have you made any tests yourself or do you know of any positive tests that have been made showing the presence of pesticides in fruit that has been, say, thoroughly washed—in other words, showing that that pesticide or chemical was present inside the fruit and was not present on the outside of the skin?

Dr. POTTENGER. I have in my possession a letter from the Bureau of Chemistry, the State of California, implying that it is unsafe to eat the skin of fruits that are produced at the present time.

(The correspondence referred to follows:)

MONROVIA, CALIF., *December 6, 1951.*

Mr. VINCENT A. KLEINFELD,
Chief Counsel, Select Committee,
House Office Building, Washington, D. C.

DEAR MR. KLEINFELD: I am enclosing herewith a photostatic copy of the letter to which I referred in my testimony.

A further statement that might have bearing on the question that was asked me is the following: In one instance, one of my patients had an episode of gastrointestinal upset and a can of pears was suspected. This can of pears, along with an unopened can purchased at the same time and containing identical markings on the can and label, was turned over to the United States Food and Drug Administration. Although these pears had been peeled and cored before canning, they were found to contain parathion.

It was a pleasure to appear before your committee and I sincerely hope that I have been able to help in correcting this serious abuse of American health which is so prevalent today.

Sincerely,

FRANCIS M. POTTENGER, Jr., M. D.

STATE OF CALIFORNIA,
DEPARTMENT OF AGRICULTURE,
September 7, 1949.

Dr. F. M. POTTENGER, Jr.,
Monrovia, Calif.

DEAR DR. POTTENGER: Our Los Angeles district office has reported your observations with regard to certain of your patients becoming ill shortly after eating one pear each.

If the pears were peeled I cannot see how any spraying material that is now used could have been the cause of their difficulty. The common spraying materials are usually easily removed by washing, under normal conditions, and it seems doubtful if it would be possible to have enough of any type spray residue remain after proper preparation of the pears to give anyone any difficulty.

Our inspector learned that the pears had been purchased at Tony's Jolly Boy Market in Monrovia and drew a sample from some of the pears identified as being from the same lot and which were still remaining on hand. This sample of pears was found by our laboratory to contain no parathion, lead, arsenic trioxide, or fluorine, and only a slight amount of DDT. Of the two pears which you gave the inspector and requested an analysis, one was found to carry a little DDT and the other was analyzed only for parathion which was found nil. These analyses are only indicative as several fruits are necessary to make up a suitable sample and it is not possible to analyze for both DDT and parathion on the same fruit.

We are much interested in your study of possible difficulties from use of the newer organic insecticides and wish to be as helpful as we can. In general, it is not possible for us to make detailed analysis as you request from time to time as our duties are set up under the law to see that fruits and vegetables sold in the State conform to the tolerances established by law. If you are interested in setting up a laboratory for extensive analytical work, we will be pleased to provide you with information with regard to methods or any other data that will be helpful.

Very truly yours,

ALLEN B. LEMMON,
Chief, Bureau of Chemistry.

SEPTEMBER 24, 1949.

Dr. ALLEN B. LEMMON,
Chief, Bureau of Chemistry,
Sacramento, Calif.

DEAR DR. LEMMON: I wish to thank you for your letter of September 7 with reference to the pears which I sent to you. We have always served pears and apples on our trays unpeeled, after they were washed, of course. This has been done because we have always acted on the theory that there are important vitamins in the skin. Therefore it appears to me that any permanent agricultural practice that would allow this portion of the fruit to become dangerous to human welfare is not in the best interest of the people. If it is necessary to permit the use of such pesticides, the public should be fully informed that it is necessary to peel these fruits. Inasmuch as the old arsenic and lead of years ago occasionally presented problems to us at the sanatorium by causing serious gastrointestinal upsets, we employed a system for removing this material from the vegetables and the fruits.

I regret that my present facilities do not allow me to delve more deeply into the study of pesticides as they affect foods. I appreciate your offer to assist me in so doing. Would it be possible for me to obtain a copy of the methods which you use in case I am able to make further investigation?

It may be of interest to you to know that I have been cooperating with the United States Food and Drug Administration in Washington for some time in obtaining specimens of human fat for analysis. Preliminary observation suggests that the cumulative effects of chlorinated hydrocarbon pesticides may be very deleterious.

Thanking you for your report and for your interest, I am,

Sincerely yours,

FRANCIS M. POTTENGER, Jr., M. D.

Mr. JONES. What I am trying to get at—do you have any records of tests that have been made by reputable laboratories showing the presence of—excluding the possibility that the chemical would be on the outside of the skin and merely had not been removed through the washing process?

Dr. POTTENGER. That it penetrates the skin?

Mr. JONES. Yes.

Dr. POTTENGER. Yes.

Mr. JONES. You say you have evidence it does actually penetrate the skin and get down into the fruit?

Dr. POTTENGER. Yes; and from my own experience in handling patients.

Mr. JONES. In other words, you have made the tests on that particular fruit?

Dr. POTTENGER. I have had them eat the fruit, and peel the fruit and eat only the apple itself without the core or the skin. They do get it. But it is also in the skin and in the core.

Mr. JONES. In other words, have you actually tested that fruit itself?

Dr. POTTENGER. I have not done the testing myself; no, sir.

Mr. JONES. You have had reputable laboratories do those particular tests?

Dr. POTTENGER. Yes.

Mr. JONES. Do you have the names of those laboratories, or where that data is available? Do you have the data from the laboratory?

Dr. POTTENGER. I have, as I say here, the Bureau of Chemistry—it will take me a little time.

Mr. JONES. Could you furnish the committee with the data on those tests showing how they were made and the results?

Dr. POTTENGER. I can't tell you all of the methods that they used; I can only give you the report.

Mr. JONES. You can tell us the laboratory that made the tests so by further inquiry we can find how they were made?

Dr. POTTENGER. The Bureau of Chemistry of the State of California—Dr. Lemmon.

Mr. JONES. We had Dr. Lemmon before us at San Francisco, and I think we went into it rather thoroughly, but we did not get testimony to that effect, as I recall it.

Mr. KLEINFELD. No; we did not.

Mr. MCDONOUGH. Dr. Pottenger, do you know of any insecticide besides DDT that is as injurious as you have outlined DDT is in your statement?

Dr. POTTENGER. Well, DDT analyses are made on the facts of notations by the Food and Drug Administration at Washington and by the United States Public Health Service in Savannah. My understanding is that the method used is for the determination of total chlorinated hydrocarbon pesticides in terms of DDT.

Mr. MCDONOUGH. Oh.

Dr. POTTENGER. Which would include chlordane, and all of that group of chemicals.

Mr. MCDONOUGH. So that any chlorinated hydrocarbon in sufficient quantities to cause these effects would not necessarily be DDT but would be any other pesticide that was a chlorinated hydrocarbon?

Dr. POTTENGER. Of that group, yes.

Mr. MCDONOUGH. Well, then, would you recommend that the label of a pesticide should be required to state the quantity of the chlorinated hydrocarbon, and cautions to the user definitely stated, the quantities stated on the label, and with respect to the risk he is taking in using it?

Dr. POTTENGER. I think it should be.

Mr. MCDONOUGH. That would be stated as chlorinated hydrocarbon, DDT, or any of the other trade names for these things?

Dr. POTTENGER. Yes, sir.

Mr. MCDONOUGH. Now, in the jaundice effects that you have outlined in these cases here as a result of absorbing DDT or other pesticides, how did you clear that up in the patient? What do you do to clear it up? Is it long-standing, or can it be cleared up quickly?

Dr. POTTENGER. Some of these effects are long-standing because, in the first place, apparently DDT is taken up by the body, it is stored in the fat of the body. At least on the basis of our autopsy records, we have suggestive evidence that the storage of DDT in their fat is running fairly high in certain people.

Now when you have an acute episode which you suspect as being due to the pesticides, the good old-fashioned catharsis is the first thing to clean up the gastro-intestinal tract. The next thing is to find out how much damage has been done. The use of crude liver extract, the use of atropine, and the use of adrenal cordical extracts are necessary.

As I mentioned before, very frequently 10 days to 2 weeks after they have had these episodes, there are respiratory effects—effects like a cold that seem to follow.

If you are taking temperature records on these people you will find that sometimes with an acute episode they have no fever, some-

times they do have a fever, and you will find that they are particularly exhausted and will run low temperatures during this time. So you have to treat these people very carefully. If they have had repeated episodes you will find they are beginning to show evidence of chronic effects. They become nervous. It is in patients of that type that we have found the highest concentration of DDT in their fats.

Mr. McDonough. Now did you find in the history of those patients that they absorbed the DDT from meats or fruits or other foods that they had eaten, or were they engaged in the application of DDT and pesticides?

Dr. Pottenger. None of my patients have been engaged in the commercial application of it. Some were housewives, and others were farmers.

Mr. McDonough. They were not professionally engaged for that purpose?

Dr. Pottenger. No, and they would have necessarily gotten it from their foods or incidental usage.

Mr. McDonough. Now what about the workmen in the field who apply it and it is in the atmosphere all the time? They probably have a gas mask and take some precaution against it, but they are bound to absorb a little. Do the workmen become the patients who require hospitalization?

Dr. Pottenger. I know, not from personally handling such patients, of several instances.

Mr. McDonough. I am familiar with the work your father has done in Los Angeles County on tuberculosis, Dr. Pottenger, and it has been one of the great contributions to the cure and prevention of tuberculosis here, and as far as that is concerned, to the Nation.

The problem that we are facing, as you know, is to find out whether we should recommend definitely against the use of DDT as an insecticide at all. We have heard a lot of evidence that it is very detrimental both to people who eat the food and who apply the insecticide. Do you think it would be too severe to say that DDT should not be used for that purpose, or should we recommend that every precaution be given to the public by having the label reveal that the product contains the material? Which would be your recommendation?

Dr. Pottenger. The economics and implications of the problem are most serious. Whether entomologists could provide us with normal fighters against the predatory insects, I do not know. If they can, I think it would be much wiser than to use the present chlorinated hydrocarbons, because we do not know what is going to happen. If people, after 4 or 5 years, who have no reason to suspect that they have DDT in their bodies, are found to have from zero to 33 parts per million of DDT in their fat, what is going to happen after we have been using DDT from 10 to 15 years? That is the serious thing to me.

Mr. McDonough. By that I gather that although the person who absorbs it in the first instance may have no immediate ill effects, he may have an ill effect 5 or 6 years afterwards; is that true?

Dr. Pottenger. It is possible that it could. We do not know how much it is going to increase.

Mr. McDonough. I see.

Dr. Pottenger. In other words, if we can go by laboratory experiments, a rat that has five parts per million of DDT in its fat

shows physical evidence that he has been injured. Now if a man has five parts per million of DDT in his fat and is carrying it around for several years, what is that going to do to him? If it is going to build up over the years, if he becomes more and more exposed to it, what is going to be the final effect?

It may be that as long as it is stored in his fat and is not used it is not going to have a serious effect. But, suppose for instance, he has some illness, a secondary illness in which he is required to use his own body fats. He may have enough toxic material in his own body fat to poison him. That I think is one of the most serious implications of the problem.

Mr. McDONOUGH. That is all.

Dr. HEDRICK. Doctor, do you believe that DDT should ever be used around dairy barns?

Dr. POTTENGER. No, I do not think that it should.

Dr. HEDRICK. You do not think the cows should ever be sprayed, or the walls of the barn should ever be sprayed with it in any form?

Dr. POTTENGER. No. I think that in Chicago the food and drug people of that city have taken appropriate action in that matter. Because, after all, DDT is concentrated in the cream and in human beings it has been reported by others that a very high concentration of DDT is present in mothers' milk. I won't quote figures because I don't remember the exact amounts, but much higher than any we have ever seen in the fat of any of our patients.

Dr. HEDRICK. That is especially true in butter from the cow?

Dr. POTTENGER. Yes. And, as I understand it, you do not have to spray the cow at all, just the fact that they are in the barns that have been whitewashed or painted with DDT.

Dr. HEDRICK. Well, you think this DDT question is a pretty serious matter then, don't you?

Dr. POTTENGER. I certainly do.

Dr. HEDRICK. Do you think that some legislation should be made to control it?

Dr. POTTENGER. I am of that opinion; yes.

Dr. HEDRICK. I see.

Mr. McDONOUGH. Not necessarily limited to DDT?

Dr. POTTENGER. I am glad you brought that up. When I say "DDT" I hope you will interpret what I mean there.

Mr. McDONOUGH. It is only a trade name.

Dr. POTTENGER. That is right. It is only one of many chlorinated hydrocarbon pesticides.

Mr. McDONOUGH. That is correct.

Dr. HEDRICK. Mr. Kleinfeld, do you have any questions?

Mr. KLEINFELD. Yes.

Dr. Pottenger, are you familiar with an article entitled, "Occurrence of DDT in Human Fat and Milk," reprinted from the AMA Archives of Industrial Hygiene and Occupational Medicine of March 1951?

Dr. POTTENGER. Yes; I am familiar with it.

Mr. KLEINFELD. This article discloses that the persons who made these experiments got their samples of human fats from you, is that true?

Dr. POTTENGER. That is correct.

Mr. KLEINFELD. And analyzed them.

Dr. POTTENGER. Yes.

Mr. KLEINFELD. I suggest, Mr. Chairman, that we put this short article in the record. It indicates the analytical data by these people on samples of fat furnished by Dr. Pottenger.

Dr. HEDRICK. If there is no objection, it is so ordered.

(The article referred to is as follows:)

[Reprinted from the A. M. A. Archives of Industrial Hygiene and Occupational Medicine, March 1951, vol. 3, pp. 245 and 246. Copyright, 1951, by American Medical Association]

OCCURRENCE OF DDT IN HUMAN FAT AND MILK

Edwin P. Laug, Ph. D., Frieda M. Kunze, B.S., and C. S. Prickett, M. S., Washington, D. C.)

From Division of Pharmacology, Food and Drug Administration, Federal Security Agency

Before it is possible to evaluate any chronic occupational DDT exposure it is necessary to determine a base line, i. e., what exposure, if any, is suffered by the general population. DDT has had widespread use. Investigations conducted by the Food and Drug Administration indicate that this has resulted in traces of DDT appearing in some truck crops, dairy and meat products, and more recently even in flour. To evaluate DDT exposure by repeated analyses of individual dietaries of a large number of persons would be technically very difficult. However, experiments conducted in our laboratories [1] have shown that the storage of DDT in adipose tissue is an extremely sensitive "biological magnifier" of trace amounts of ingested DDT. For example, we have shown that 0.1 p. p. m. DDT in the diet of the rat leads to the storage of about 10 to 15 p. p. m. DDT in the fat. On the assumption that human fat would respond by storage of DDT consumed in traces, an attempt has been made to use this sensitive indicator as a gage of DDT exposure in the general population.

Seventy-five samples of human fat were analyzed for DDT. The specimens were furnished through the cooperation of Dr. Francis Pottenger, of Monrovia, Calif. The samples were all abdominal fat obtained at autopsy, biopsy, or abdominal surgery. Since it appeared likely that traces of ingested DDT might be excreted in human milk, 32 samples from 32 different Negro women outpatients of a District of Columbia hospital were analyzed for DDT. The specimens were furnished through the cooperation of Dr. E. A. Clark.

It must be emphasized that none of the subjects were occupationally employed as pesticide operators. Protocols of all cases examined were kept. These indicated that the greatest possible amount of DDT to which they were exposed must have come from the diet, although in a few instances the inhalation of DDT-containing sprays and dusts incidental to their use in and about the home could not be excluded.

DDT analyses were made by a modified Schechter procedure,[2] sufficiently sensitive to detect and quantitate 5 μg. of DDT in 100 ml. milk or 1 μg. DDT in 1 Gm. of fat. The modified Schechter procedure was found to give the same results as the standard Schechter procedure, using the method of Clifford,[3] in which the isolation of the ortho and para isomers of DDT is used to establish the identity of DDT. For additional discussions of this method, reference should be made to the paper by Laug and associates.[1] Special care was taken to separate the DDT from the fat before attempting its colorimetric determination.

RESULTS

The results of analyses of 75 samples of human fat are given in table 1. This shows the number of cases in which DDT was found in each of six ranges of con-

[1] Laug, E. P.; Nelson, A. A.; Fitzhugh, O. G., and Kunze, F. M.: Liver Cell Alteration and DDT Storage in the Fat of the Rat Induced by Dietary Levels of 1 to 50 P. P. M. DDT, J. Pharmacol. & Exper. Therp. 98 : 268, 1950.

[2] Prickett, C. S.; Kunze, F. M., and Laug, E. P.: Modification of the Schechter Method for the Determination of Methoxychlor or DDT in Biological Materials, J. A. O. A. C. 33 : 880, 1950.

[3] Clifford, P. A.: Determination of DDT, Particularly in Milk and Fats, by the Schechter Procedure, J. A. O. A. C. 30 : 337, 1947.

centration. Approximately one fourth of the specimens examined contained no DDT, or only traces (0.1 to 1.0 p. p. m.). The two values in the high concentration range were respectively 26 and 34 p. p. m., the latter from an infant. The average for all samples was 5.3 p. p. m. An explanation for the skew distribution pattern of the samples at the low DDT concentration range was sought in the possible effect of sex on the fat storage of DDT. Males and females, however, were equally represented, and statistical analyses showed no significant difference between the sexes (p=0.05).

Table 1.—Range of concentration of DDT in 75 samples of human fat

Range, p. p. m. DDT:	Cases	Range, p. p. m. DDT:	Cases
0.0	15	10.1–20.0	9
0.1– 1.0	7	Over 20.0 [1]	2
1.1– 5.0	21	Average concentration=5.3 p. p. m.	
5.1–10.0	21		

[1] Actual values were 0.25, 0.28, 0.42, and 0.77 p. p. m.

Table 2.—Range of concentration of DDT in 32 samples of human milk

Range, p. p. m. DDT:	Cases	Range, p. p. m. DDT:	Cases
0.00	2	Over 0.20 [1]	4
0.01–0.05	3	Average concentration=0.13 p. p. m.	
0.11–0.15	13		
0.16–0.20	2		

[1] Actual values were 26 and 34 p. p. m.

Table 2 shows the range of concentration of DDT found in 32 samples of human milk. These results give a normal distribution pattern, with a frequency maximum coincident with the average concentration of 0.13 p. p. m. for all 32 subjects. This concentration of DDT is of the same order as that found within the past year in a number of market milks analyzed by the Food and Drug Administration. The four samples of human milk in the high concentration range showed 0.25, 0.28, 0.42 and 0.77 p. p. m. In none of these cases could the high values be correlated with any extraordinary known exposure to DDT.

In summary, this preliminary survey shows that DDT occurs in human fat and milk, presumably as the result of the widespread use of DDT with consequent contamination of a number of important foodstuffs. On the basis that man stores DDT in his fat at the same rate as the rat it may be assumed that traces of DDT in the average human dietary are of the order of 0.05 p. p. m. As yet clinical data are not available to assess whatever danger may be associated with the DDT stored in the fat or excreted in human milk in the quantities reported.

Mr. KLEINFELD. Dr. Pottenger, this article concludes as follows:

As yet clinical data are not available to assess whatever danger may be associated with the DDT stored in the fat or excreted in human milk in the quantities reported.

Is that in line with your thought that we do not know as yet, from clinical data, the danger which may or may not be present from the occurrence of DDT in human fat and milk?

Dr. POTTENGER. I think that information is gradually being accumulated.

Mr. KLEINFELD. We do not know it yet, do we?

Dr. POTTENGER. No. Observation of my own patients is the reason I state that I feel it is a serious problem.

Mr. KLEINFELD. Mr. Chairman, I also have here a fairly recent report dated August 16, 1951, submitted to this committee by the Food and Drug Administration, entitled "DDT in Fluid Milk and Certain Other Staple Foods."

It records the experimental work performed by the Food and Drug Administration in the recent past on samples of milk and meat to

determine the quantities of DDT present. As I read the statement, they found fairly small quantities being stored.

Since this is of recent origin, I suggest that it be made a part of the record.

Dr. HEDRICK. If there is no objection it is so ordered.

(The document referred to is as follows:)

DDT IN FLUID MILK AND CERTAIN OTHER STAPLE FOODS

FOOD AND DRUG ADMINISTRATION, AUGUST 16, 1951

Mr. John Dendy of the Texas Research Foundation, Renner, Tex., testified before the Delaney committee in regard to DDT contamination in various foods. He stated that he had examined a number of samples of fluid milk and found DDT ranging from less than 0.5 to 13.83 parts per million. He also analyzed three samples of beef and pork and found a maximum of 68.55 parts per million of DDT and a minimum of 18.27 parts per million in the fat. He sprayed several plots of corn with DDT and found a maximum of 8.11 after two sprayings and a minimum of 3.72 parts per million after one spraying in the shelled corn.

Since 1949 and before the work of Dendy had been reported the Food and Drug Administration examined a number of samples of the same or similar products and found only very small amounts of DDT. The number of samples and range of DDT found is given in the following table:

Product	Number of samples	Range of DDT in parts per million
Fluid milk	120	Nil to 0.32.
Evaporated milk	37	Nil to 0.70.
Wheat flour	6	0.02 to 0.11.
Corn meal	3	0.04 to 0.07.
Corn grits	2	Nil.
White bread	7	Nil to 0.11.
Butter	4	0.6 to 2.0.
Lard	4	Nil to 0.8.
Oleomargarine	8	Nil.

Since the work summarized above was more than 1 year old, the Food and Drug Administration examined a number of samples of various staple foods to determine the current levels of DDT. Samples were collected in June 1951 according to the following schedule:

1. *Fluid milk.*—Twelve samples were collected from Dallas, Fort Worth, and Houston, Tex.

Eight samples were collected from producers in western Wisconsin since considerable milk is sometimes shipped to Texas from this area.

Six samples each were collected in and around Chicago, Cincinnati, and New York, and 5 from San Francisco for general informational purposes.

Three samples were collected from Missouri and one from Kansas City, Kans., since some milk from the area is shipped to Texas.

2. *Butter.*—Since there is a tendency for DDT in milk to be concentrated in the butter, 6 samples of butter produced in western Wisconsin were collected.

3. *Evaporated milk.*—Six samples were collected in New York, San Francisco, and Chicago.

4. *Meat.*—Six samples of beef were collected from packing houses in the Fort Worth-Dallas, Tex., area.

5. *Lard.*—Six samples were collected from packing houses in the Fort Worth-Dallas area.

6. *Corn.*—Six samples were collected from corn meal mills in Texas.

7. *Corn oil.*—Since DDT would be concentrated in the corn oil, four samples were collected from producers in Illinois and Iowa.

The samples of fluid milk were examined by Mr. F. M. McNall in the Cincinnati laboratory of the Food and Drug Administration. All other samples were examined by Mr. P. A. Clifford in the Division of Food, Food and Drug Administration, Washington, D. C.

The microcolorimetric method for DDT with lipolytic hydrolysis of fat, described in methods of analysis of the Association of Official Agricultural Chem-

ists, ed. VII, 24.36 (b) 24.40 was used on all samples. Five-gram samples of butter, lard, meat, fat, and corn oil, 50-gram samples of evaporated milk, and 100-gram samples of fluid milk and corn were used for analysis.

Amounts of DDT less than 0.05 parts per million in milk and corn and amounts less than 0.1 parts per million in evaporated milk are reported as traces since the method of analysis does not have a high degree of precision with extremely small amounts of DDT. Much smaller samples of fatty materials are used in the analysis and consequently the degree of precision is less than above. Thus, on such products as butter, meat, lard, and corn oil, results below 1.0 parts per million were reported as traces. Where there was no evidence of DDT by analysis, the results were reported as nil. The results on the samples collected as outlined above are listed on the attached table I, DDT in Various Food Products—June 1951.

Mr. Dendy states that all DDT analyses reported by him were made in accordance with the Schechter method for the determination of DDT in milk and related fatty material. In a private conversation Mr. Dendy indicated that he used the sodium sulfate-sulfuric acid modification of the Schechter method. Chemists in the Food and Drug Administration prefer the lipaso modification of the method. Either modification gives accurate results in the hands of chemists in the Food and Drug Administration.

Evidence is not available to prove that any of the samples examined contained enough DDT to be harmful to health.

TABLE I.—*DDT in various food products, June 1951*

Sample No.	Product	Where collected	DDT (parts per million)
97-352 K	Fluid milk	Norwood, Ohio	0.07
97-353 K	do	Cincinnati, Ohio	.05
97-354 K	do	do	.08
97-355 K	do	do	.07
97-356 K	do	do	.10
97-357 K	do	do	.05
73-085 K	do	New York, N. Y	.09
73-086 K	do	Brooklyn, N. Y	.05
73-089 K	do	Long Island City, N. Y	.06
73-090 K	do	New York, N. Y	Trace
73-094 K	do	do	Trace
73-095 K	do	do	Trace
77-968 K	do	Lebanon, Mo	Trace
77-969 K	do	Springfield, Mo	0.05
89-765 K	do	Kansas City, Kans	Trace
89-766 K	do	Blue Springs, Mo	0.05
85-367 K	do	Bloomer, Wis	.36
85-368 K	do	do	.31
85-369 K	do	Barron, Wis	Trace
85-370 K	do	Chotek, Wis	Trace
85-371 K	do	Rice Lake, Wis	Trace
85-372 K	do	do	Trace
85-373 K	do	Spooner, Wis	0.05
85-374 K	do	Shell Lake, Wis	Trace
20-977 L	do	Dallas, Tex	0.08
20-978 L	do	do	.07
20-979 L	do	Fort Worth, Tex	.19
20-980 L	do	Dallas, Tex	.10
20-981 L	do	do	.07
20-982 L	do	Fort Worth, Tex	.08
20-983 L	do	do	.06
20-984 L	do	do	.07
20-985 L	do	Dallas, Tex	.11
21-078 L	do	Houston, Tex	.13
21-079 L	do	do	.13
21-080 L	do	do	.13
32-915 K	do	San Francisco, Calif	Trace
32-916 K	do	do	Trace
32-918 K	do	Oakland, Calif	0.06
32-919 K	do	San Francisco, Calif	.05
32-920 K	do	do	.08
58-986 K	do	Chicago, Ill	Trace
58-987 K	do	Barrington, Ill	Trace
58-988 K	do	North Prairie, Wis	0.07
58-989 K	do	Antioch, Ill	.06
58-990 K	do	Chicago, Ill	Trace
58-991 K	do	do	0.06
85-375 K	Butter	Bloomer, Wis	Trace
85-376 K	do	Barron, Wis	Trace
85-377 K	do	Rice Lake, Wis	Trace

TABLE I.—*DDT in various food products, June 1951*—Continued

Sample No.	Product	Where collected	DDT (parts per million)
85-37 K	Butter	Turtle Lake, Wis	Nil
85-379 K	do	Spooner, Wis	Trace
85-380 K	do	Cumberland, Wis	Trace
20-967 L	Lard	Dallas, Tex	Trace
20-968 L	do	do	1.4
20-969 L	do	do	Nil
20-973 L	do	Fort Worth, Tex	Trace
20-974 L	do	do	1.0
20-975 L	do	do	Trace
54-220 K	Beef fat	Dallas, Tex	Trace
20-972 L	do	Fort Worth, Tex	Trace
20-966 L	do	Dallas, Tex	2.4
20-970 L	do	Fort Worth, Tex	Trace
20-971 L	do	do	Trace
54-200 K	do	Dallas, Tex	Nil
73-084 K	Evaporated milk	New York, N. Y	Trace
73-087 K	do	do	0.13
33-363 K	do	San Francisco, Calif	.28
33-364 K	do	do	Trace
58-994 K	do	Chicago, Ill	Trace
58-996 K	do	do	Trace
00-474	Corn	Sherman, Tex	Nil
00-521	do	do	Nil
00-557	do	Beaumont, Tex	Nil
00-558	do	do	Nil
00-475	do	Dallas, Tex	Nil
00-516	do	Fort Worth, Tex	Nil
58-998 K	Corn oil	Argo, Ill.[1]	Nil
58-999 K	do	Cedar Rapids, Iowa [1]	Nil
59-000 K	do	Decatur, Ill.[1]	Nil
65-261 K	do	Clinton, Iowa [1]	Nil

[1] Place of manufacture. Sample collected in Chicago, Ill.

Mr. KLEINFELD. Dr. Pottenger, have you had any experience with the use of stilbestrol in poultry?

Dr. POTTENGER. I have been very much interested for years in the fact that there is a trend to rapid growth in boys and girls in the United States. They are growing very tall, with long feet and long hands, and produce large bodies like we get with the capon. I have been interested in it more as a philosophical matter.

I believe some of my work was reported by another before this committee last year, by the way, on the fact that there seems to be a trend among boys and girls to a neutrality of configuration and not too full maleness and femaleness.

Now with the present-day trends to hybridize and to desex practically everything we get as food, from cattle, hogs, sheep, and now all of our poultry, our sterile eggs, and our cereals without germ, I think we are coming into a problem where maybe the use of the stilbestrol in the producing of the capon may be a problem that is as serious for the human being, as it is for the mink and that it should be thoroughly investigated before the practice is allowed to continue.

Mr. KLEINFELD. You think that the addition of stilbestrol to poultry is part of a larger picture, which is causing you concern?

Dr. POTTENGER. There is no question that it gives you a heavier bird, a larger bird.

Mr. KLEINFELD. You mean that the use of stilbestrol in chickens and other poultry is part of a larger problem, a problem that is an accumulative one?

Dr. POTTENGER. Exactly.

Mr. KLEINFELD. And we can't say definitely what may be the consequences a number of years from now; is that correct?

Dr. POTTENGER. That is exactly it.

Mr. KLEINFELD. Do you believe that we should have further investigation in connection with the use of stilbestrol in poultry?

Dr. POTTENGER. Before it is permitted to continue. As I understand it, it is not only being used in poultry now, but is being used in animals for the same purpose.

Mr. MCDONOUGH. Mr. Chairman.

Dr. HEDRICK. Mr. McDonough.

Mr. MCDONOUGH. In previous hearings on the use of stilbestrol—I think it was in Washington—we were informed that the additional fat that the chicken acquired was not good. It added weight and added volume, but on rendering it down it was tough and stringy as compared to normal fat that that chicken would grow without the additional stilbestrol. Have you had any experience with that?

Dr. POTTENGER. Well, I think it is correct that the meat is softer. I would not be able to say anything about its protein content, for instance, and things of that kind which could be easily analyzed.

Mr. MCDONOUGH. Yes.

Dr. POTTENGER. But I know personally I do not like the caponized fowl.

Mr. MCDONOUGH. Does stilbestrol add any fiber, or just a certain amount of water?

Dr. POTTENGER. Metabolic water.

Mr. MCDONOUGH. Metabolic water?

Dr. POTTENGER. Yes.

Mr. MCDONOUGH. And is there any relationship between that and estrogens in face creams? Is that metabolic water that's produced as a result of the use of that?

Dr. POTTENGER. It is.

Mr. MCDONOUGH. It has the same effect, it increases the volume?

Dr. POTTENGER. It increases the volume, of course, by changing the sex. We have known for centuries that go back long before Biblical times, the six sexes of cattle—the male, the female, the young castrate male, the young castrate female, the late castrate male, the late castrate female, which are six different animals.

Mr. MCDONOUGH. Now you have not answered my question.

Dr. POTTENGER. The steer has soft muscles and it is the one that we have come to want because it has much more water in the fiber, a much softer fiber and therefore we use the steer's meat. If you use the old bull, he has tough muscle fiber, it does not shrink. The old-time hamburger joint that wanted to give you a hamburger that did not shrink wanted bull meat, it did not want steer meat.

Castration gives you entirely different characteristics of flesh and muscle. So that is the point—there is much more metabolic water in the steer than there is in the bull.

Mr. MCDONOUGH. However, the danger is the effect it will have on human consumption rather than the increase in the volume of the flesh of the animal, is it not?

Dr. POTTENGER. That is what I am more concerned about.

Mr. MCDONOUGH. And you think the use of stilbestrol tends toward sterility in human beings? It does, we know, in the lower form of animal life.

Dr. POTTENGER. If it will do it to the mink, and if it will do it to the rabbit and the rat and the hog, and even to the cow, if injected, I can't see why it won't do it to the human.

Mr. MCDONOUGH. Yes.

Dr. POTTENGER. Of course, we do not get the pellets out of the neck of a hen as the mink did, but, anyway, there is enough of the hormone in the tissue to have changed the body.

Mr. MCDONOUGH. Now, in writing legislation to protect the public against a thing like that, do you think it is sufficient precaution to put the information on a label and let the people take it at their risk, or should it be further controlled?

Dr. POTTENGER. Well, the caponet has been very highly advertised.

Mr. MCDONOUGH. Yes.

Dr. POTTENGER. But the public does not know what the caponet is biologically. It is advertised on soap operas for one of the big processors.

Mr. MCDONOUGH. I think we had at one of the hearings in Washington a statement that the caponet dealer should label the caponet when it goes to the restaurant and that the menu should state, "This is caponet meat and stilbestrol was used in the production of it."

Dr. POTTENGER. I think that would be fair.

Mr. MCDONOUGH. That is in the hearings some place along the line. Now, whether we want to go that far to give the public a precaution against it—I was wondering about your opinion of that.

Dr. POTTENGER. It should at least appear on the animal when the person purchases it in the market; and if it is served at a public restaurant, I think the public should be informed.

Mr. MCDONOUGH. Just like oleomargarine or any other synthetic product. That is all, Mr. Chairman.

Mr. JONES. I want to get a question in here. Do I understand your statement? I was interested in these changing characteristics of the youth of our country and the physiological changes that you suggested are appearing. Would the same characteristics appear in a capon that was surgically caponized as appear in a caponet from the use of stilbestrol?

Dr. POTTENGER. The end result is practically the same.

Mr. JONES. In other words, if I have followed you, if a person would confine his diet to, say, capon and steer and the cereals from which the germ is removed and things like that you at least are investigating, your theory is that that might have some effect upon the sex of the individual whose diet would be confined to those things?

Dr. POTTENGER. Yes; that is the point.

Mr. JONES. That is very interesting to me. I guess it is the first time we have had that brought out. We have had it brought out about stilbestrol, but at least I had not gathered from any of the testimony which we have had that we would get the same result where the chemicals were not used in bringing about this change.

You think there is an actual change in the elements making up those food products?

Dr. POTTENGER. I think there definitely is.

Mr. JONES. That is very interesting.

Mr. KLEINFELD. Dr. Pottenger, within the recent past, the Food and Drug Administration has seized in New York City, in butcher shops, what is called New York dressed poultry, in which were contained

from 1 to 4 unabsorbed stilbestrol pellets, each one being, I think, of the strength of 15 milligrams. Some were partially absorbed and some were not, but the pellets were there.

Would you be concerned with that picture?

Dr. POTTENGER. Yes; particularly if it was prepared with the food. I am not sure what the exact temperature is at which stilbestrol is destroyed and whether it would be destroyed by cooking. That is the point a person would want to know a little bit more about—the temperature of the cooking of the bird. But if left in, and a person ate the neck and got the pellets, it might give them a temporary upset.

Mr. KLEINFELD. Would you say that the use of stilbestrol in poultry caused an increase in the weight primarily by a building up of the water content?

Dr. POTTENGER. It is a metabolic means of watering the animal.

Mr. KLEINFELD. So that the consumer is paying some more money for water; is not that right?

Dr. POTTENGER. Yes.

Dr. HEDRICK. Will you yield there, Mr. Counsel?

Mr. KLEINFELD. Yes.

Dr. HEDRICK. How much weight would a chicken gain by this treatment, an ordinary chicken?

Dr. POTTENGER. I can't say exactly, but I think about a third.

Dr. HEDRICK. In other words, if a chicken weighed 3 pounds, it would probably weight 4 from this treatment then?

Dr. POTTENGER. That is right.

Dr. HEDRICK. That might be rather profitable, as high as chicken is now.

Dr. POTTENGER. And also they use thiouracil in fattening animals to destroy the thyroid—another means of metabolically watering which should be investigated.

Mr. KLEINFELD. I have no further questions.

Mr. MCDONOUGH. To follow Mr. Jones' question about having the same effect by castration as you do by the use of stilbestrol, you said that the effects are about the same?

Dr. POTTENGER. Yes.

Mr. MCDONOUGH. Am I correct in believing that with the use of stilbestrol you may have a surplus of the amount of material that would bring about metabolic water, while if you castrate, the animal itself adjusts the amount by its own system? In other words, if you use the pellet on the capon, you have a surplus; you can't say this pellet exactly is the amount necessary to bring about the metabolic water that would be brought about by castration.

Dr. POTTENGER. Well, the pellet is sufficient female—or I should say synthetic female sexlike hormone to suppress the normal male hormone of the bird.

Mr. MCDONOUGH. Yes.

Dr. POTTENGER. Or the female hormone when given to animals. And in so doing it has the same total effect as if you removed the male sex factor.

Mr. MCDONOUGH. Yes.

Dr. POTTENGER. And in doing that then you change the characteristics to the neutral female type and that tends to put on water?

Mr. MCDONOUGH. Right.

Dr. POTTENGER. And it tends to put on watery fat, and it tends to build the various portions that are not built if it is a normal male. That's the purpose of it.

Mr. MCDONOUGH. But the human being absorbing meat of a castrated animal would not be affected insofar as sterility is concerned as quickly as he would be if he were to absorb meat from an animal injected with stilbestrol, would he?

Dr. POTTENGER. There is a surplus in the pellet.

Mr. JONES. Not in the animal.

Mr. MCDONOUGH. Not in the animal if castrated. If castrated, the animal itself balances the difference.

Dr. POTTENGER. You remove the male sex effect from the animal and it does have an overbalance of female sex effect.

Mr. MCDONOUGH. Yes.

Dr. POTTENGER. However, that would be at a lower level than with the addition of stilbestrol, which overbalances the male.

Mr. MCDONOUGH. That is the point that I wanted to make.

Mr. JONES. What I got from the doctor's statement a minute ago—let's just keep the chicken there.

In other words, the capon that had had stilbestrol pellets administered and the capon which had been surgically caponized, if he excluded that part of the animal that the pellet is in and just used the meat from the rest of the body, he would get the same effect from the castrated animal that he would from the animal that had stilbestrol. That is what I got from your statement a minute ago.

Dr. POTTENGER. That is probably true, yes, because you have the overbalance of the female sex in either one.

Mr. JONES. Each one of them?

Dr. POTTENGER. Yes.

Mr. JONES. That is right?

Dr. POTTENGER. Yes.

Mr. JONES. That is new to me.

There is one other question I think we should clear up—the statement that was made about the buying of the water in the animal. I think an inference has been left that someone is practicing a——

Mr. MCDONOUGH. Deceptive action.

Mr. JONES. Deceptive action in increasing the water content, and I think there might be some disagreement there. Because if I get a piece of meat like you spoke about from the steer that has more water, I would certainly rather pay for the meat that had the water in it than the bull meat without the water in it. The same thing is true of buying grapefruit. I would rather buy grapefruit filled out with water than a dried-up grapefruit. So the quality enters into it, would you not say?

Dr. POTTENGER. That is true.

Mr. JONES. So in many cases people would prefer to buy the water and pay the same price as to get it dehydrated; is that right?

Dr. POTTENGER. Yes, that is according to our training.

Mr. JONES. At least you would say the public generally would prefer to do that even with their eyes open?

Dr. POTTENGER. Yes.

Mr. KLEINFELD. Unless they had a third choice of getting regular chicken without the water, and of the same weight; in that case they would probably desire that.

Mr. JONES. Those who have not enough teeth, Mr. Counsel, prefer to have a tender animal as far as eating qualities are concerned, than to have a tough one.

Mr. KLEINFELD. The only point I am making is that a natural young chicken in which stilbestrol has not been used may be nice and tender. You don't have to go to a caponet.

Mr. JONES. How about grapefruit?

Mr. KLEINFELD. I suppose you could get good natural grapefruit.

Mr. JONES. It has water.

Mr. KLEINFELD. Sure, natural water; the water has not been added.

Dr. POTTENGER. That is right.

Dr. HEDRICK. Doctor, it has been said by rather prominent scientific men that we are being so exposed to chemicals in sprays and otherwise nowadays so that the American people are being gradually poisoned to death. What do you think about that?

Dr. POTTENGER. I have read those statements and it may be true, or it may not be true. Whether we are building resistance to it or not I don't know, but I am very much concerned about the chlorinated hydrocarbon pesticides for fear that that is true.

Dr. HEDRICK. Doctor, we thank you very much. It is very nice of you to be so patient with us. Thank you for coming.

Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Krohn.

(The oath was administered by the chairman.)

Dr. HEDRICK. Have a seat, sir.

TESTIMONY OF BERNARD KROHN, M. D., LONG BEACH, CALIF.

Mr. KLEINFELD. Dr. Krohn, will you please read your statement, including your biographical data?

Dr. KROHN. Yes, sir. My name is Bernard Krohn of 5887 Atlantic Avenue.

I received my B. A. and M. D. degrees from the University of Michigan. I was licensed to practice medicine and surgery in Michigan in 1946 and in California in 1948. I served in the United States Army from June 1943 to September 1945, and I followed postgraduate studies in health insurance at the University of Pennsylvania in 1947. In 1948 and 1949 I practiced medicine in Detroit, Mich., at Central Hospital, and since 1950 I have been practicing medicine at the Francis M. Pottenger, Jr., Clinic in Monrovia, Calif.

There has been a change since I wrote this statement, and I am now in practice in Long Beach, Calif., in association with Drs. Lang and Losner.

In collaboration with Dr. Pottenger I have written an article on DDT poisoning which the American College of Physicians has accepted for publication in the Annals of Internal Medicine.

Since I have written this statement—that was, I believe, last February that they accepted it for publication—they wrote us that after careful consideration the editorial board had accepted the paper for publication, and recently, that is, within the last week or two, we have received a letter from them in which they have asked us to make certain changes in it before the editorial board would publish it.

In 1945 three English physicians gave themselves doses of DDT to see what it would do. They became tired, weak, and irritable; their limbs ached and they felt mentally dull.

Dr. V. D. Wigglesworth, one of the three, was completely disabled for 10 weeks. But they lived to report their experiences in the British Medical Journal (2, 12). Since then we have been learning how dangerous these pesticides are.

Findings: In the past year and a half I have seen the following evidence that chlorinated hydrocarbon pesticides can cause chronic illness:

1. I examined four patients who complained of exhaustion, irritability, and mental dullness which appeared after repeated exposures to these pesticides and which lasted more than 6 months. We examined their blood and found two signs that something had damaged their livers; the amount of cholesterol in their blood was abnormally high, and so was their icteric index. With the assistance of Millicent Cole, R. N., I removed 3 grams of fat from the abdomen of each patient and had it analyzed by the United States Food and Drug Administration. They reported that each sample contained over 5 parts per million of DDT equivalent; this is a toxic amount, according to their chief pharmacologist, Dr. Arnold Lehman (5). The exact concentrations were 15 p. p. m., 6.5 p. p. m., 19 p. p. m., and 33 p. p. m. Dr. Lehman also reported that this concentration causes liver damage in rats (5).

Summary: Feeding DDT to animals causes nervous disorders and liver damage (1, 3, 7, 8, 10, 11). Four humans were exposed several times to these pesticides; they stored the pesticides in their tissues; they developed the same disease as the poisoned animals; and the disease persisted for more than 6 months.

2. With the assistance of Lydia Howard, R. N., I examined more than 100 other patients who were exposed to chlorinated hydrocarbon pesticides. These patients had the nervous disorders and liver damage described above. I advised them how to avoid further exposure and treated them for the damage they had suffered. They recovered slowly and still had some symptoms at the end of 3 months or more.

3. Looking for evidence of pesticide poisoning, I reviewed the pathologist's report on 20 autopsies chosen at random at the Huntington Memorial Hospital, a large general hospital in Pasadena. The United States Food and Drug Administration had analyzed fat specimens from these cadavers at the request of Dr. Francis M. Pottenger, Jr. They found chlorinated hydrocarbon pesticides in 19 of the 20 specimens; they found over 5 parts per million, the toxic level, in 4 of the 20 specimens. The pathologist reported liver damage in 16 of the 20 cadavers. These patients died from such diseases as cancer, heart disease, and pneumonia; some of these diseases might have contributed to the liver damage.

Summary: Almost all of a group of cadavers chosen at random had DDT-pesticides in their tissues; some had high concentrations. Eighty percent of the cadavers had liver damage, which commonly results from DDT poisoning (1, 3, 7, 8, 10, 11).

4. I examined 14 people who live in the Bardsdale area, near Fillmore, Calif. This is an agricultural area where they use chlorinated hydrocarbon pesticides. Eight of the fourteen had signs and symptoms of pesticide poisoning. The United States Food and Drug Administration analyzed fat specimens from 2 of these 8 and found they contained 19 p. p. m. and 33 p. p. m. of chlorinated hydrocarbon pesticides, respectively. These are toxic levels. All of the eight had

suffered from their symptoms for many months. A fat specimen from one of the group that had no signs or symptoms of pesticide poisoning contained no pesticide.

Summary: More than half of a group of people living in an agricultural area where they use DDT pesticides had signs and symptoms of pesticide poisoning. Tissue analyses in selected cases confirmed the diagnosis.

Views: Chlorinated hydrocarbon pesticides can cause chronic poisoning because they are potent, stable, and cumulative (4). You can take several small doses, each of which might not hurt you by itself; but they accumulate in the body, chiefly in the fat, and add up to a big toxic dose that can cause chronic illness (4).

Everyone does not succumb equally to these pesticides. Some people appear to be healthy even though they have large amounts of pesticide in their tissues (6). Others develop typical signs and symptoms when they have only a small concentration of pesticide in their tissues (9).

A given amount of DDT pesticide presents a different degree of hazard to the public under different circumstances. Conditions that increase the hazard are the following: (1) Lack of rain to wash pesticide off crops, (2) pesticide being used in high concentration, (3) pesticide being dissolved in an oil solvent, (4) pesticide being absorbed through the roots of the plant, (5) pesticide being applied shortly before marketing the crops or while food is in grocery store, (6) pesticide being applied many times.

Mr. McDonough. Let me interrupt you there for a minute. Where you say pesticide, in all of these six instances, do you mean a chlorinated-hydrocarbon pesticide?

Dr. Krohn. I do.

Mr. McDonough. I think that should be clear as far as the record is concerned, because pesticide is rather general in application, is it not?

Dr. Krohn. I believe that two sentences before I read the list I mentioned DDT pesticide.

Mr. McDonough. Yes.

Dr. Krohn. And I think that is important. Many manufacturers and users of pesticides are trying sincerely to protect the public. But from my own observations I know that many people are suffering from chronic pesticide poisoning.

Recommendations: We should have a Federal statute requiring anyone who uses a pesticide on or near food to prove that his methods do not make the foods poisonous for human consumption. Present laws are inadequate. They charge the Food and Drug Administration with finding the poisoned foods in a tremendous flood of crops, an almost impossible task. Manufacturers, growers, and purveyors of food should be required to prove that they have not added enough pesticide to their products to make them toxic to susceptible people; they should have to do this before being permitted to sell their products.

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Dr. HEDRICK. Doctor, is any of this DDT eliminated by any of the organs of the body?

Dr. KROHN. Yes; it is eliminated in the urine and in the sweat.

Dr. HEDRICK. It is just not eliminated fast enough, that is the trouble, is it not?

Dr. KROHN. That is the trouble.

Dr. HEDRICK. Is it eliminated by the liver through the bile tract?

Dr. KROHN. Yes; it is, much of it is.

Dr. HEDRICK. That is my impression, that there is more eliminated that way than any other way.

Dr. KROHN. That is a very important way because the liver is probably the most important organ in the detoxification of the body.

Dr. HEDRICK. That is correct.

Any questions, Mr. Jones?

Mr. JONES. What indications do you have that DDT is absorbed through the roots of a plant?

Dr. KROHN. I have personally not investigated it. However, I have read an investigation which was performed in Florida, I believe, by Dr. Deederer, and they found that the fruits down there which were grown on trees were able to pick up the chlorinated hydrocarbon pesticides that had been sprayed on the year before, and that it was fairly evenly distributed throughout the fruit.

In other words, it came up through the roots of the tree.

Mr. JONES. Well, that, I think, is the first time we have had that brought to our attention.

Dr. KROHN. I am not positive that he is the man, but I have the reference and can look that up.

Mr. JONES. I have no other questions.

Dr. HEDRICK. Do these sprays penetrate the covering of an orange, for instance, do you think?

Dr. KROHN. If it is only given from the outside in one application, there is a possibility that the inside might escape contamination. But where you have a grove that is sprayed every year there is a possibility that the DDT could be absorbed through the roots of the tree, and then it would be throughout the orange, not just in the skin.

Dr. HEDRICK. You don't think the skin will absorb it from a spray on the orange?

Dr. KROHN. You mean will it penetrate the skin and go underneath it?

Dr. HEDRICK. Go through the skin and penetrate the orange juice?

Dr. KROHN. I don't know of any evidence on that. It is just a matter of speculation if I answer you.

Mr. JONES. May I ask another question there?

Dr. HEDRICK. Yes.

Mr. JONES. Do you have any evidence here in California—and you do have a big industry here—that DDT has been absorbed through the roots? You mentioned the Florida case. Do you have any evidence here in California?

Dr. KROHN. I have not seen any. It may be, but I have not seen any.

Mr. JONES. Nothing further.

Dr. HEDRICK. Mr. McDonough, do you have any questions?

Mr. MCDONOUGH. Do you think the amount of DDT used to kill the pests is more than enough, or would the economy of the industry be seriously affected if it were not used at all?

Dr. KROHN. There is no doubt that if we stopped using chlorinated hydrocarbons right now the economy of the industry would be upset within a few weeks.

I believe there was some testimony before your committee by the Assistant Secretary of Agriculture on that point.

Mr. MCDONOUGH. Yes.

Dr. KROHN. However, it is possible that other methods could be used to control the pests, and thereby relieve the strain on the industry.

Mr. MCDONOUGH. Have you ever done any testing on the effects of hydrocyanic acid in killing pests in the citrus industry?

Dr. KROHN. I have not.

Mr. MCDONOUGH. You have confined your tests to the chlorinated hydrocarbons?

Dr. KROHN. Yes.

Mr. MCDONOUGH. You have not discovered that there is any point at which you could use just enough without affecting the consumer of the fruit as compared to using too much and having an accumulation?

Dr. KROHN. That is the problem—where to set the toxic level—because of two things: No. 1 is that a level in a given piece of fruit which may not be toxic to anyone might be toxic to everybody if they ate enough pieces of that fruit. That is instead of one orange, if they ate a dozen oranges in a period of 3 days, they would then get 12 times the dose, and though they would excrete some of it, they would still store a good bit of it.

The other problem is what is a toxic dose, not in the allergic sense, but in the poison sense, of causing actual destruction without the allergy? A dose which would be safe for one person might be dangerous for another person.

Mr. McDonough. Do you find that the liver of these people that have been affected by chlorinated hydrocarbons has an organic infection there?

Dr. Krohn. The evidence of liver damage that we have seen has not been of the infectious type. Now it is quite probable that the liver damage resulted directly from the insecticides.

Mr. McDonough. Well, the damage to the liver, what was it, an overworking? Did the DDT require the liver to overwork itself in order to remove the toxic effect of the DDT, or was it actually infected?

Dr. Krohn. Well, infection requires the presence of a germ.

Mr. McDonough. Yes.

Dr. Krohn. There was no evidence there was a germ present. However, you raise another question—does the damage result from a process like applying a match to some tissue and thereby destroying it, or does DDT make the liver work too fast and thereby burn itself out, so to speak?

Mr. McDonough. Yes.

Dr. Krohn. There is some evidence which was produced by the Food and Drug Administration that DDT does make the liver work faster. We do not know whether that is the way it hurts the liver. It may or may not be.

Mr. McDonough. That is all.

Dr. Hedrick. What does it do to the liver cell? Does it congest it, make it larger, or what?

Dr. Krohn. Necrosis, which is local death, occurs, and there are other pathological changes.

Dr. Hedrick. Does it affect the blood circulation in the liver?

Dr. Krohn. It affects the blood in one way that we are sure of, and that is, it prevents the liver from excreting broken-down blood cells properly, and they then remain in the blood stream in an abnormally high amount, giving what we call jaundice, which you can test chemically in the laboratory, and we have done that, of course. We found there was that change.

Dr. Hedrick. Mr. Kleinfeld?

Mr. Kleinfeld. I just want to ask, Dr. Krohn, if you would mind sending to the committee the article on DDT to which you referred?

Dr. Krohn. Iwould be glad to, yes.

Mr. Kleinfeld. Thank you.

[The article referred to appears at the end of the witness' testimony.]

Dr. Hedrick. Have you done any work on hormones, Doctor?

Dr. Krohn. I was with Dr. Pottenger for about 2 years and we did much work with hormones.

Dr. Hedrick. What is your opinion of estrogenic hormone face creams? Should they be used?

Dr. Krohn. I think there are cases where they are of benefit. However, I think the use of any of these potent things should be under the direction of a physician rather than being used by anyone who is interested but not trained at all.

Dr. Hedrick. You take the lady who is just getting into the post-period of life with wrinkles around her eyes. Do you really think that helps those wrinkles?

Dr. Krohn. I think estrogenic hormone in a case like that has definite benefits. But there is another reason you have to be careful.

Suppose that lady you mentioned had a cancer in her breast, for instance, the estrogenic hormone would be very bad for her.

Dr. HEDRICK. Well, that would be true if the doctor gave her a hypodermic injection of 15,000 international units.

Dr. KROHN. The difference is that the doctor would determine ahead of time if she had cancer, but I doubt that she could find it if she examined herself.

Dr. HEDRICK. In other words, a lady with a lump in her breast should be very cautious about using estrogenic hormones?

Dr. KROHN. Yes. She could have a cancer without even knowing it. That is the thing. I don't think that doctors give estrogenic hormones without making sure the patient does not have cancer.

Dr. HEDRICK. Do you really think that estrogenic hormones might cause cancer?

Dr. KROHN. I do not think that there is any evidence it can cause cancer, but we know it can spread it and make it worse under certain conditions.

Dr. HEDRICK. You would not go so far as to say it would cause cancer, would you?

Dr. KROHN. I see no evidence to indicate it.

Dr. HEDRICK. Is there anything further?

Mr. KLEINFELD. No.

Dr. HEDRICK. Thank you very much. You have been a very valuable witness.

Dr. KROHN. Thank you.

POISONING FROM DDT AND OTHER CHLORINATED HYDROCARBON PESTICIDES: PATHOGENESIS, DIAGNOSIS, AND TREATMENT

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The widespread use of chlorinated hydrocarbons, such as DDT, in agriculture, animal husbandry, and about the home has been accompanied by a syndrome of hepatic and neurologic damage, and sometimes death. Animal experiments (5, 14, 16, 19, 23, 26, 32, 36, 39, 43, 47, 48) and human experiments (4, 9, 20, 21, 42, 46) have shown that DDT and similar insecticides can cause this type of damage. In this clinic over 100 cases of this syndrome have been placed on record in the last year. But until the introduction of fat biopsies there was no way of proving whether or no insecticides were the etiological agents in living patients. To prove the diagnosis of insecticide poisoning in a living patient one must show three things: (1) Typical symptoms, (2) evidence of characteristic pathology, and (3) presence of insecticide in the patient's tissues. This paper presents the first reported series of cases in which all three of the above requirements have been satisfied.

The properties that make chlorinated hydrocarbons poisonous to insects also make them poisonous to mammals. Lauger, Martin, and Muller (27) in 1944 postulated the two characteristics which make these compounds harmful, and without which they cannot be harmful. First, the molecule must have a toxic component which probably interferes with an essential enzyme system. Parachloro, fluoro, and methoxy substituted phenyl rings are outstanding in this connection. Second, the molecule must have a lipophilous component which causes the chemical to accumulate in fat, such as nerve lipids. This allows the concentration to build up to a damaging level. These postulates were confirmed in 1946 by Kirkwood and Phillips (23). In the same year, Roeder and Weiant (39) of Tufts College showed that the tremors characteristic of DDT poisoning in the cockroach are due to an intense bombardment of the motor neurons and that the bombardment originated in the afferent neurons. They demonstrated a series of high frequency trains of axon spikes in the afferent neurons; these reactions resulted from DDT perfused through the leg of a cockroach in concentrations as low as 0.01 parts per million. They found that it took concentrations above 1,000 parts per million to affect the motor neurons directly. The

earlier work of Yeager and Munson (49) dealt only with this latter phase, but it gave a classic description of the symptoms of toxicity in the DDT poisoned roach (which have also been described in the housefly) (24): "Increased activity, the eventual appearance and persistence of contraction and tremors in the appendages and body, erratic behavior, and loss of equilibrium."

These same symptoms in humans after exposure to comparable doses of DDT were described by Biskind and Bieber in 1949 (6). The most common symptom was extreme apprehensiveness. Also of importance were excitement, hyperirritability, anxiety, confusion, inability to concentrate, inattentiveness, forgetfulness, and depression. These observations were confirmed by Lehman (30). Biskind and Bieber also observed headache, insomnia, and disturbances of equilibrium. When DDT attacks the autonomic nervous system, tachycardia, dermal ischemia, sweating of the palms, and a sense of impending syncope result. Biskind reports that this is followed by bradycardia, flushing of the skin, relaxation and cessation of palmar perspiration. Some investigators have intentionally exposed themselves to DDT to note ensuing symptoms. R. A. M. Case and a colleague (9) exposed their skins to DDT in 1945. They noted tiredness, heaviness, and aching of the limbs. There was extreme irritability as well as a great distaste for work of any sort. They complained of a feeling of mental incompetence and also suffered from severe joint pains. In the same year V. D. Wigglesworth (46) put an acetone solution of DDT on his skin for a brief length of time. He noted extreme nervous tension and anxiety as sequelae. He was completely disabled for 10 weeks and had not entirely recovered at the end of a year.

According to Lauger's postulates, chlorinated hydrocarbons should be able to damage any organ that has enough fat content to let them accumulate until they reach a damaging level. Such has proven to be the case in laboratory mammals. The liver has been found to suffer regularly from the insecticides (5, 16, 35, 36, 40, 41). Kidney damage was found (35, 36); necrosis of voluntary muscles (16, 36, 40); thyroid damage (36, 40); nervous tissue damage (35, 40); and rare myocardial and adrenal lesions (36) have been described. The dermatitis which has been described (35, 36) may result from impairment of fat metabolism (38).

The pathology that appeared in the above-named organs was as follows:

Liver.—Hypertrophy of the centrolobular cells with an increased cytoplasmic oxyphilia, plus increased basophilia and margination of the cytoplasmic granules, and a tendency to hyalinization of the remainder of the cytoplasm. There was frequently a centrolobular hepatic cell necrosis superimposed which appeared to be recent (16).

Kidney.—Renal lesions were infrequent, except in rabbits. Nelson, Draize, Woodard, et al (36) found a focal tubular and interstitial lesion in the kidney.

Thyroid.—Loss of colloid; epithelial desquamation (36).

Nerve tissue.—Partial tigrolysis of anterior horn cells with pericellular vacuolation; loss of Nissl bodies in the reticulated lightly basophil cytoplasm of the anterior horn cells and pericellular regions and presence of paranuclear vacuoles. Generally the physiological changes are much greater than the morphological changes (32).

Skin.—Hyperkeratosis and thickening of the stratum spinosum; occasional slight cellular infiltration in the underlying corium; slight focal epidermal necrosis.

In cases of human deaths from insecticide poisoning the pathological changes were similar to acute poisoning changes in animals (4, 21). The reported cases of insecticide deaths were the spectacular ones, involving swift death from massive exposure. Pathological diagnosis was made at autopsy (4, 20, 21, 42). But many other patients may die slowly from insecticides without the true cause of their death being recognized.

The following work shows how easily such toxicity might escape notice. Haag, Finnegan, and coworkers (19) reported increased mortality in rats from chronic chlorinated hydrocarbon insecticide toxicity. Yet the tissues of these animals showed no changes at autopsy. In short, one could not prove the diagnosis of insecticide toxicity in these animals by clinical or laboratory methods. But their lives were shortened by insecticides.

We shall never know how many humans suffer similarly. Only the outstanding cases come to public notice. During 1949, 300 cases of occupational illness and one fatality from agricultural chemicals were reported in California alone. Thirty of these were definitely from chlorinated hydrocarbon insecticides (2);

there was a possibility that 117 of the others may have resulted from the same cause.

There are three ways by which humans absorb insecticides, but there are many by which they are exposed to them. Toxic doses can be absorbed through the skin (14, 19, 41), through the gastrointestinal tract (4, 19, 21, 36, 41) and through the lungs (19, 35). Chlorinated hydrocarbons are so commonly used to kill flies about the house that almost everyone gets exposed. Some cities have a "spray day" when everyone is expected to spray his home and environs thoroughly with one of the chlorinated hydrocarbons (37). In other cities, airplanes drop a blanket of DDT (3, 11, 33), thereby exposing all their inhabitants. Insecticides are used on most farm crops and on many meat and dairy animals (34). Toxicity may result from eating the fruits and vegetables directly sprayed or from eating others grown the following season on the same soil: the later crop picks up the insecticide through its roots, stems or leaves (10, 11). Toxic concentrations have been found in the meat of cattle who ate sprayed forage (8). Carter, Hubanks, Mann, and Schopmeyer (8) cooked this meat by five different methods to see if cooking had any effect on the concentration of DDT. They roasted, broiled, pressure-cooked, braised, and fried different samples of meat but they found the concentration of unmodified DDT to be the same after cooking as it was before.

Chlorinated hydrocarbon residues are commonly found on fruits and vegetables (44), but they are not considered dangerous unless they contain over 0.049 grains per pound (6.4 p. p. m.), (the tolerance allowed by the United States Food and Drug Administration). The concentration of DDT on some crops has been found to be three times this level when there was inadequate rain (17). DDT has also been found in milk: in 1945 Woodard, Ofner, and Montgomery (48) showed that if a dog ate DDT, the insecticide would be excreted in the milk. Later the same year Telford and Guthrie (43) showed that it was transmitted into the milk of white rats and goats that ingested it. The United States Department of Agriculture issued a notice (45) on April 7, 1949, advising that insecticides containing DDT should not be used directly or indirectly on dairy animals or on their feed or on the feed of animals being finished for slaughter. The notice stated that DDT had been found in the milk even when it was used for ordinary fly control in the barn.

The United States Food and Drug Administration advises that there should not be over one part per million of DDT in the food a person eats if all the food is contaminated. If only one food is contaminated, the Administration advises that it should not contain over five parts per million (13, 29). In common terms, one teaspoon of DDT mixed through 10 tons of food is one part per million. These limits were obtained by rat experiments (28) because rats appear to react similarly to man in their tolerance to these toxins. However, Arnold J. Lehman, Chief of Pharmacology of the United States Food and Drug Administration pointed out that human tolerances are not really known and that it might take 10 years after exposure to find all the important facts (7).

The toxic potentialities of chlorinated hydrocarbon insecticides are increased by the fact that the body can store them. Exposure to one subtoxic dose may not produce any detectable damage, but some of the insecticide will be retained in the body fat. Repeated exposures may increase this store until it reaches a toxic level (26). Woodard, Ofner, and Montgomery (48) found the concentration of DDT in the fat of five of their experimental dogs to be many times the lethal intravenous dose (0.04 mgm. per gram of body weight). The dogs had managed to stay alive by keeping the DDT out of circulation. (The animals in question had 4.94, 1.65, 0.67, 0.39, and 0.08 mgm. per gram of body weight, respectively, in their fat.) Toxicity arises when the animal draws on its fat for energy. As the fat is used up, the stored insecticides are released into the blood. Fitzhugh and Nelson (16) found that the concentration in the blood can reach the level of acute toxicity under these circumstances.

The body's first method of protecting itself against these toxins is to excrete them. Evidence has been presented that chlorinated hydrocarbons are excreted in the bile and in the urine (25, 41). Suggestive evidence that the liver may detoxify the body is found in the work of Jandorf, Sarett, and Bodansky (22) who found that the oxygen consumption of the liver rises when rats are fed DDT. Proof has been presented that DDT disappears from the fat when administration is stopped (26, 48.)

How long it takes to detoxify so that signs and symptoms disappear depends on the individual. Even with treatment several months are usually required. The only quantitative investigation of this matter which we could find was

done on laboratory animals. In rats 25 percent of the DDT was still present in the fat 3 months after exposure was stopped (26).

Exposure to high concentrations of chlorinated hydrocarbons or the presence of them in the body does not always result in toxicity. If these insecticides are not dissolved in organic solvents, they are less toxic than if so dissolved (4, 21, 41, 48). Also tolerance varies greatly among individuals and among species (19, 36). I. Gordon (18) reported cases of massive exposure to DDT in an organic solvent among natives in British West Africa in which the subjects showed no signs of toxicity. One case has been reported of a man who had no symptoms in spite of having 200 parts per million of DDT in his fat (31). In the cases presented in this paper there was great variance in individual susceptibility, some patients showing toxicity on only slight exposure. It is not possible to predict at this time how much any one individual can stand without injury. As Draize, Nelson, and Calvery (14) have shown, death and debility need not result from the direct action of insecticides; they often result from secondary infections which follow toxic anorexia and emaciation.

The following case abstracts are of patients who presented (1) typical symptoms and signs of chlorinated hydrocarbon poisoning; (2) evidence of liver pathology; (3) chlorinated hydrocarbon detectable in fat removed by biopsy. The determination of pesticide in the fat biopsies were done by the United States Food and Drug Administration under the direction of A. J. Lehman. The findings were reported in terms of DDT equivalent. We have found the blood cholesterol level and the icteric index to be the most sensitive clinical tests for liver pathology; and they were found disturbed in this series of cases. By the methods that our laboratory uses the normal range of blood cholesterol is 140–180 mgms., and the normal icteric index is 4–6. In addition to the treatment noted, all patients received a high protein diet, with high vitamin content, plus lecithin. (Lecithin contains choline and is lipotropic.)

Patient 14099.—Male, age 43, rancher first seen March 27, 1949.

Symptoms and signs.—March 28, 1949, palate cyanotic. Left patellar reflex is clonic. Antebrachial reflexes hyperactive. April 26, 1949, circumorbital bronzing. June 1949, felt weak. September 1949, began to feel a bit better. February 2, 1950, extreme irritability, anxiety, exhaustion, weakness, anorexia, diarrhea, icterus, circumorbital bronzing.

Exposure.—Had been using DDT spray about the ranch for many months.

Evidence of pathology.—March 28, 1949, blood cholesterol 151 mgms. (normal), hemoglobin 12.5 gms., leucocytes 14,000, sedimentation rate 5 mm./60 mins. February 7, 1950, cholesterol 190 mgms., icteric index 8.4, sedimentation rate 5mm./60 mins., hemoglobin 14.8 gms., leucocytes 19,600.

Fat biopsy.—Taken February 7, 1950, contained 15 parts per million DDT.

Treatment.—Crude liver extract, adrenal cortical hormones. Has been improving since under treatment, but has not fully recovered.

Patient 13592.—Female, age 45, housewife, first seen February 20, 1948.

Symptoms and signs.—Low energy, gastrointestinal upsets, backache. Enlarged nontender liver which persisted through March 13, 1950.

Exposure.—Believes that chlorinated hydrocarbon insecticides were used on the fruits and vegetables she bought.

Evidence of pathology.—February 20, 1948, hemoglobin 14.2 gms., blood cholesterol 200 mgms., sedimentation rate 32 mm./60 mins. July 1, 1949, hemoglobin 12.2 gms., blood cholesterol 180 mgms., icteric index 5.5., sedimentation rate 88 mm./60 mins.

Fat biopsy.—Taken September 14, 1949, contained 4.6 parts per million DDT.

Treatment.—Adrenal cortical hormones, crude liver extract. Recovery has been slow, but symptoms are disappearing.

Patient 14286.—Male, age 44, dentist, commander in United States Navy during World War II, first seen September 1, 1949.

Symptoms and signs.—Disseminated dermatitis, stiffening of all the joints of the body. Had suffered from fatigue since discharge from Navy in 1945, gradually lost 28 pounds. Generalized erythematous rash about the face, the upper portion of the thorax, and a butterfly distribution about the bridge of the nose and the malar prominences. Yellow cast to fundi.

Exposure.—Heavy exposure to DDT while stationed at Midway from August 1943 to July 1944. Also exposed August 1944 to May 1945. Had been using an aerosol bomb about the house recently.

Evidence of liver pathology.—September 2, 1949, blood cholesterol 208 mgms., hemoglobin 13.8 gms., sedimentation rate 12 mm./60 mins. February 3, 1950, blood cholesterol 201 mgms., hemoglobin 12.9 gms., sedimentation rate 4 mm./60

mins. March 11, 1950, cholesterol 216 mgms., hemoglobin 14.8 gms., sedimentation rate 5 mm./60 mins.

Fat biopsy.—Taken October 12, 1949, contained 10 parts per million DDT.

Treatment.—Commencing September 2, 1949, patient took lecithin orally. Five months later blood cholesterol had dropped slightly, but was still above normal. Sedimentation rate had fallen to normal, but hemoglobin had fallen also. Five weeks later cholesterol was found to have risen, so patient was started on adrenal cortical hormone and injections of crude liver extract. Patient improved notably on this regimen.

Patient 13236.—Female, age 37; wife of rancher, first seen November 10, 1947.

Symptoms and signs.—Poor appetite, low vitality, sore throat, headaches, shortness of breath, incontinence, mental confusion, vertigo, air hunger, feeling of fullness in chest, mediastinal pain, intermittent constipation and diarrhea. Icterus; poor muscle tone. In August 1949 developed acute mental upset with schizophrenic tendencies.

Exposure.—DDT and chlordane were used about the barn where the family cow was kept. Exposure continued all the time she was under treatment.

Evidence of liver pathology.—November 10, 1947, blood cholesterol 212, hemoglobin 12.0 gms. sedimentation rate 4 mm./ 60 mins.; August 15, 1949, cholesterol 240, hemoglobin 12.1 gms., sedimentation rate 5 mm./60 mins.

Fat biopsy.—Taken August 31, 1949, contained 10.35 parts per million DDT.

Treatment.—Adrenal cortical hormones, B complex vitamins, crude liver extract injections. Moved out of California and away from contact with insecticides. Since then has gradually recovered.

Patient 12644.—Male, age 37; agricultural inspector, first seen June 7, 1945.

Symptoms and signs.—Cramps and twitchings of muscles, frequent respiratory infections, stiffening of hand joints at night, low energy, pruritis of ears, left shoulder, and hands; increased irritability. Edema of nasal and oral membranes. Cyanosis of oral membranes. Tendon reflexes hypoactive.

Exposure.—From 1936 to 1940 he had charge of the use of lead arsenate, cryolite, hydrocyanic acid, etc. From 1940 to 1946 he was agricultural inspector with the work of handling and grading fruits and vegetables for size and quality. On this job he worked with arsenate of lead. From 1946 to 1948 he worked in a date-packing plant, which he sprayed in the spring of 1947, covering the entire under part of the plant with a 50-percent DDT vegetable oil solution. He made three further applications chlordane to the entire plant in 1947. Frequently used fly spray containing DDT in his office and home.

Evidence of liver pathology.—September 9, 1949, blood cholesterol 246 milligrams, icteric index 8.7; December 22, 1949, blood cholesterol 199 milligrams, icteric index 9.4; May 2, 1950, cholesterol 224 milligrams, icteric index 8.7

Fat biopsy.—Taken August 31, 1949, contained 18.3 parts per million DDT.

Treatment.—Report on fat biopsy was not received until January 1950. At this time injections of crude liver extract were begun. The patient's progress has been slow. Symptoms and signs have been partially relieved, but there is still much liver damage.

Patient 13734.—Female, age 39, housewife, first seen May 11, 1948.

Symptoms and signs.—Rhinorrhea, low backache, lesion in mouth, clammy hands and feet, disturbed capillary return circulation in upper extremities. Cyanosis. Crepitus in many joints. Large beefy, edematous tongue. September 27, 1948, dizziness, sneezing, low energy, lachrymation, abdominal discomfort, temporal headaches, circum-orbital bronzing, icteric sclerae.

Exposure.—March 25, 1949, her house was termite-proofed with a DDT preparation. The neighbors also used aerosol bombs extensively.

Evidence of liver pathology.—May 12, 1948, blood cholesterol 160 milligrams (normal), hemoglobin 13.8 grams; August 5, 1949, cholesterol 182 milligrams, hemoglobin 11.4 grams; March 3, 1950, cholesterol 206, hemoglobin 14.4 grams; March 22, 1950, icteric index 6.5.

Fat biopsy.—Taken September 14, 1949, contained 9.8 parts per million DDT.

Treatment.—Adrenal cortical hormones, oral liver concentrate, crude liver extract injections. Improved gradually after August 1950.

Patient 14240.—Female, age 51, housewife, first seen August 3, 1949.

Symptoms and signs.—Exhaustion, low energy, rough skin rash, circum-orbital bronzing, icterus of sclerae. Slightly disturbed dark adaptation of the eyes. Crepitus in many joints and poor muscle tone. Slight cyanosis of tissues of face and mouth. Edema of buccal membranes. Moist rales in right lower chest on coughing.

Exposure.—Periodic commercial spraying of garden and extensive use of DDT bombs in the house.

Evidence of liver pathology.—July 28, 1949, blood cholesterol 220 milligrams, hemoglobin 14.4 grams; August 17, 1949, cholesterol 222 milligrams, icteric index 6.3; September 22, 1949, cholesterol 204 milligrams, icteric index 5.5, hemoglobin 13.3 grams.

Fat biopsy.—Taken August 31, 1949, contained 23.6 parts per million DDT.

Treatment.—Adrenal cortical hormones, oral liver. Patient improved steadily under treatment.

Patient 14176.—Male 45, sales manager, first seen June 16, 1949.

Symptoms and signs.—Aches in knee and ankle joints, gastric distress on eating, erythematous rash over chest and back and over malar prominences of face. Disturbance of memory. Disturbed adaptation of eyes to darkness. Reduction of auditory acuity. Edema of oral and nasal membranes. Early in August showed icterus of sclerae, circum-orbital bronzing, increased erythema. Was given high liver feeding. In November had a coronary occlusion.

Exposure.—Spent considerable time in the San Joaquin Valley in early August when there was spraying; this was before examination noted above.

Evidence of liver pathology.—June 16, 1949, blood cholesterol 143 milligrams, (normal), September 2, 1949, cholesterol 206, icteric index 5.4.

Fat biopsy.—Taken August 31, 1949, showed 10.6 parts per million DDT.

Treatment.—Liver concentrate capsules orally, lecithin orally. Patient improved steadily.

Patient 14042.—Male, age 58, self-employed (heating, ventilating), first seen January 28, 1949.

Symptoms and signs.—Pain in right arm. Pain and crepitus in right shoulder. Dry skin. Lupus-like butterfly over nose. Buccal edema with slight purplish cast. Much crepitation in chest muscles. Gastrointestinal upsets. February 20, 1949, had an acute attack of appendicitis. Appendectomy was performed; recovery was slow. Complained of tired feeling for several months afterward.

Exposure.—Had been spraying home with oil solution of DDT insecticide for several months before being examined.

Evidence of liver pathology.—January 28, 1949, blood cholesterol 200 milligrams, hemoglobin 13.1 grams, sedimentation rate 25 millimeters/60 minutes. April 28, 1949, blood cholesterol 161 milligrams (normal), icteric index 5.9 (normal), hemoglobin 9.6, sedimentation rate 5 millimeters/60 minutes (normal).

Fat biopsy.—Taken September 14, 1949, contained 9.64 parts per million DDT.

Treatment.—Commencing January 28, 1949, patient received injections of crude liver extract and oral liver concentrate for several months. By April 28, 1949, the blood cholesterol had come down to normal, but the anemia was worse. Patient improved upon continuation of treatment.

Patient 1371.—Male, age 45, poultry breeder, first seen April 19, 1948.

Symptoms and signs.—Gradual loss of energy. Extreme air hunger for 15 months. Feeling of pressure in mediastinum. Slight erythematous rash on face and back and about eyes. Difficulty focusing eyes. Clamminess of extremities. Slight crepitus in wrists, ankles, shoulders. Examinations showed eyes, heart, and lungs to be normal.

Exposure.—Used 50 percent DDT powder in water to spray chicken ranch for fly control.

Evidence of liver pathology.—April 19, 1948, blood cholesterol 141 milligrams, (normal), hemoglobin 14.6 grams, (normal), sedimentation rate 11 millimeters /60 minutes; December 16, 1949, cholesterol 219 milligrams, icteric index 9.2; March 3, 1950, cholesterol 179 milligrams, icteric index 8.4, hemoglobin 16.4 grams, sedimentation rate 3 millimeters/60 minutes.

Fat biopsy.—Taken September 14, 1949, contained 9.2 parts per million DDT.

Treatment.—Commencing April 19, 1948, received oral adrenal cortical hormone daily to present. Has improved steadily.

Icterus is one of the most constant findings in the above cases, and a special word should be said about it because it often goes unnoticed. Slight icterus is becoming so common that some doctors fail to record it as an abnormal finding. We found this true in a series of 6 cases autopsied under the direction of Alvin Foord, of Pasadena. Fat from these cadavers was found to contain DDT (in one case 12 parts per million, in another 6 parts per million); there was gross and microscopic evidence of severe liver damage, yet there was no record that icterus had been observed. We have found that the color of the sclerae suggests liver damage some time before the icteric index rises above 6.

To diagnose a case of chlorinated hydrocarbon poisoning the following should be kept in mind:

(1) Neurological symptoms: Hyperirritability, apprehensiveness, anxiety, excitement, confusion, inability to concentrate, inattentiveness, forgetfulness, depression, mental dullness, headache, insomnia, disturbances of equilibrium, fatigue.

(2) Liver damage signs: Icterus, circum-orbital bronzing, poor digestion, constipation or diarrhea, poor appetite, elevation of blood cholesterol and elevation of icteric index.

(3) Exposure: The patient may not be cognizant of his exposure. He may be consuming the toxin with his food or breathing it in from dust transmitted by winds. But it is worth asking about because he may be spraying his own house or garden; in this case he can stop the exposure.

(4) Confirmation: If there is doubt, remove a 3-gram sample of the patient's fat and have it analyzed for chlorinated hydrocarbon insecticide content.

In addition to the 10 cases which we have presented here, we have records of over 100 cases of chronic insecticide poisoning in our files. We have taken fat biopsies from many of these patients and the analyses showed them to contain chlorinated hydrocarbon insecticides, sometimes in high concentrations, sometimes in low. It is difficult to estimate the incidence of this disease. Considering the ubiquitousness of these insecticides, their indestructability, and their profusion, we must conclude that there is ample opportunity for exposure. In addition to DDT the common chlorinated hydrocarbon insecticides are chlordane, gamma isomer of benzene hexachloride, methoxychlor, TDE and 2, 4–D.

It is difficult to protect people against insecticide exposure. We have already noted that some fruits and vegetables absorb chlorinated hydrocarbons from the soil; in these cases the insecticide cannot be removed from the plant. These compounds are very stable and are not affected by cooking. Peeling fruits and vegetables is beneficial where the insecticide has been sprayed on. But sometimes the chemicals become deeply incorporated in the tissue and cannot be removed (15).

In treating toxicities caused by insecticides we have different problems in the acute and chronic cases. The aim in the acute case is to (1) remove any remaining insecticide by gastric lavage, skin washing or other means suitable to the type of exposure; (2) counteract the neurological symptoms by administering phenobarbital; (3) treat for shock when this is present; (4) put the patient on a program to protect his organs from later chronic toxicity.

The more common case is chronic toxicity. Our chief aim here is to build up the liver because it is the organ chiefly damaged. We have found the following program to be the most beneficial:

(1) Crude liver extract 4 units intramuscularly every other day for at least 2 weeks. This may be continued for months.

(2) Choline daily. This may be given orally as lecithin one tablespoon 3 times a day, or it may be given as the pure choline 3 grams daily.

(3) High vitamin diet. A cocktail of one tablespoon of raw grated liver in a glass of tomato juice daily is an effective dose of vitamins A, B, and D.

(4) A high protein diet is of benefit. Aside from the methionine for the liver, we get glutamic acid here which is of benefit to the nerve tissue.

CONCLUSIONS

Chlorinated hydrocarbon insecticides are being used in all parts of the country. In 1948, 35 million pounds of DDT alone were produced (1). One teaspoon of DDT is enough to make 2 tons of food unsafe for eating. The hazard is increased by the fact that humans can absorb these insecticides through three different routes: the digestive tract, the lungs, and the skin. Chlorinated hydrocarbons are stable and not amenable to decontamination. Organic solvents increase their toxicity. They produce neurological symptoms as well as those of liver damage. Pathological studies have shown that they can damage many organs besides the liver and nervous tissue. These insecticides accumulate in fat and may build up to a toxic level although the individual may never have received a single dose of toxic potency. Individual resistance varies greatly, but the presence of chlorinated hydrocarbon insecticides in a biopsy of a patient's fat should be considered a serious matter. Diagnosis can be made on finding (1) characteristic symptoms, (2) evidence of liver pathology such as high blood cholesterol, and high icteric index, (3) presence of chlorinated hydrocarbon insecticides in a biopsy of the patient's fat. In the

presence of a history of exposure and the typical subjective and objective findings, a fat biopsy is not always necessary. Many cases go unsuspected because of their chronic insidious nature and because slight icterus is so common that it often escapes notice.

Treatment of the disease is largely a matter of repairing damaged tissues. High protein and high vitamin diet, especially the B complex of vitamins, is useful. Injections of crude liver extract speed the process. Phenobarbital is of use in controlling the neurological manifestations.

Different governmental agencies have recognized the danger which these insecticides present. The United States Food and Drug Administration is now holding hearings to determine means of control. A select committee of the House of Representatives is also investigating the matter (12).

SUMMARY

(1) The widespread use of chlorinated hydrocarbon insecticides has produced many cases of toxicity.

(2) These insecticides accumulate in fat and principally damage fat-containing organs, as the liver and nervous tissue.

(3) In the presence of characteristic signs, symptoms and blood studies, detection of chlorinated hydrocarbon insecticides in a biopsy of the patient's fat confirms the diagnosis of insecticide poisoning.

(4) Chronic toxicity from these insecticides has been observed more frequently than acute toxicity.

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Dr. HEDRICK. Who is your next witness?

Mr. KLEINFELD. Dr. Geiger.

(The oath was administered by the chairman.)

TESTIMONY OF E. GEIGER, M. D., PH. D., PROFESSOR OF PHARMACOLOGY AND TOXICOLOGY, SCHOOL OF MEDICINE, UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES, CALIF.

Mr. KLEINFELD. Dr. Geiger, what is your academic background?

Dr. GEIGER. I received my M. D. degree in 1921 from the University of Graz in Austria, an M. D. degree in 1923 from the University of Pecs, Hungary, and my Ph. D. degree in 1947 from the University of Southern California.

Mr. KLEINFELD. And you are now professor of pharmacology and toxicology at the School of Medicine, University of Southern California?

Dr. GEIGER. That is right.

Mr. KLEINFELD. In the fields of pharmacology and toxicology?

Dr. GEIGER. I did research in pharmacology, metabolism, and nutrition.

Mr. KLEINFELD. Please read your statement.

Dr. GEIGER. I followed with interest the hearings of your committee and am pleased that you have given me the opportunity to participate in the promotion of a solution to the problem under discussion.

Since my graduation from medical school—1921—I have had insight into many phases of the problems under discussion by your committee.

I have spent about 20 years in pharmacological and toxicological research and teaching, and realize, therefore, how difficult it is to decide even by comprehensive experiments whether a substance introduced into the daily food may be harmful or toxic to man.

In the last 10 to 12 years I became more interested in human nutrition and concentrated my research and teaching activities mainly to this field, so I realize that one of the most ardent problems is to provide ample food for the ever-growing population. That this cannot be achieved presently without the use of fertilizers, pesticides, preservatives, and other functional agents seem to be evident. We have to realize that even the judicious use of such agents may harbor some health hazards which, however, are certainly preferable to starvation, malnutrition due to crop failure, or to loss of livestock. To argue against the use of chemicals in the many phases of food production would mean to deny the important achievement of agricultural, nutritional, and food technological research.

Through my earlier connection as director of research of a large drug manufacturing house, and from 11 years as advisor of nutrition of the Van Camp Sea Food Co., Inc., I also became well acquainted with the psychology and mechanics of industrial research. I have seen that industrial research has naturally to be profitable to the sup-

porting concern, but I doubt whether there are many cases where profit has knowingly been given preference over safety and quality of the product. Therefore undue suspicion or severe legal restrictions in development and marketing of new products may to a certain degree hamper research and progress in this field.

This more or less clarifies my viewpoint, which seems to be in good agreement with most of the earlier testimonies.

Coming to the special problems facing the pharmacologist, I think, in the first place, that the common definition that chemical additives are such substances which are not present normally at all, or not in the applied concentration in food should be somewhat expanded. Food ingredients produced synthetically should also be carefully investigated for their safety. Glycerin, e. g., a constituent of natural fat, was produced synthetically in Germany during the last war. Such synthetic glycerin, although sold as "chemically pure" material, proved to be highly toxic in rat-feeding experiments. We know also that some of the synthetic amino acids often differ from batch to batch in growth-promoting effect, although they are sold as chemically pure substances. It seems that some byproducts of the synthesis sometimes are present in minute quantities which are not detected by the routine chemical analysis but nevertheless affect the functions of the animal body. Therefore it seems advisable to expand the investigation also in this direction.

As to the so-called safety tests themselves, we unfortunately do not have as yet any standardized methods for the routine performance of these investigations. Valuable general suggestions have been published by Drs. Lehman, DeEds, Oser, and so forth, but nearly each individual case brings up different problems and requires the careful planning by expert investigators. Such investigators have to be trained equally well in the pertinent territories of animal and human nutrition, intermediary metabolism, pharmacology, and pathology. There are not many such experts available presently but they could be trained within a few years in sufficient number. We have seen recently how the demand created by atomic or television research produced within a short period of a few years a surprisingly large number of first-class experts in this field.

Until the time that enough specialists are available, each experiment should be planned by the cooperation of nutritionist, pharmacologist, and pathologist.

In the conventional method to determine acute experiments the LD–50 may give some indication as to which functions or organ systems are primarily attacked. But such tests may be misleading if not evaluated expertly, because a single dose in an acute experiment may affect primarily different functions and organ systems than does the chronic protracted feeding of smaller doses.

In planning of the so-called chronic experiments, five problems have to be considered: (1) The type of animal; (2) the composition of the test diet; (3) the dose admixed; (4) the duration of the test; (5) the evaluation of the results.

These problems have been amply discussed during these hearings and therefore I would like to point out just some of the pitfalls which may lead to the false feeling of security derived from such investigations. The various animals are different from man, and whether the rat or the rabbit is more closely related to us or whether the chicken

is more like man as was claimed at the meeting of the Heart Association a few days ago by Dr. Katz from Chicago, is a question of opinion.

But there is, for example, the purin metabolism, which in man and anthropoid apes is different from that of other animals. This metabolic process could be disturbed in some phases by a chemical present in food, but its effect may not show up in animal experiments even when most of the common laboratory animals are used.

The next problem is the composition of the basal experimental diet. We know, for example, that the damaging effect of galactose is mitigated by high fat diets, and some substances again may show their toxic effects primarily on low-protein diets.

We know also that not only the quantity but also the quality of the carbohydrate may modify the effect of an added chemical, possibly by its action on the intestinal flora.

It would be ideal if each substance could be investigated on high fat, on high carbohydrate and high- and low-protein diets. Also experiments with nutritionally inadequate diets should be performed. Some damaging effects may show up only under such conditions, and a large segment of prospective human customers of food products certainly does not consume such an ideal diet as catered in good laboratories to experimental animals.

The third question is in which concentration the investigated substances should be admixed to the experimental diets. I think it is, for the time being, just a guess whether it should be 10 times, 50 times, or 100 times the concentration which is intended to be used in food for human consumption. The argument that the dose has to be high because some people may eat, for example, two to three loaves of bread is unrealistic. Such individuals have certainly to be disregarded as have the oversensitive people representing the distal and of a frequency distribution curve.

I do not want to repeat the old, used-up slogan that "any substance may be toxic in high enough concentration," a slogan usually introduced in order to confuse the issue, but I feel that too high concentrations may, for instance, damage the gastrointestinal tract. This damage is correlated more to concentration than to the quantity and therefore cannot be used to evaluate fairly the effect of much lower concentrations present in human food.

The feeding experiments should be extended at least for three or four generations. The question of whether feeding a rat for 100 days really recapitulates the possible damage done in man during 10,000 days feeding, for example, seems to be at present rather a philosophical problem, and should not be discussed.

In evaluating the effects observed in the experimental animals, it seems questionable whether appearance of the animals, growth, weight promotion, and the macroscopic and microscopic changes in liver, kidney, stomach, and so forth, are themselves satisfactory criteria. It is evident that biochemical and pharmacological methods should be applied and functional tests should be performed more frequently. There are also substances which do not produce any visible damages, but may through their influence on secretory mechanisms and gastrointestinal motility create discomfort. I do not see yet any way to investigate how the higher nervous functions, the mental abilities are influenced with chemicals in the diet. The confusion which has been created by animal experiments in the question whether glutamic acid

increases human intelligence should be a warning against this type of approach to the problem. In spite of these deficiencies, animal experiments usually provide enough important information, but it cannot be emphasized strongly enough that they are not an absolute safeguard against possible damage in man.

Pharmacological, nutritional, and medical research has not yet had the time and mainly does not have the facilities and the financial support to solve experimentally the complex problems which have been raised recently by the fast developments of the chemical and food industry. Therefore, the most important question seems to be to decide whether there is a real need for the introduction of a new substance, with all its possible hazards. It has to be decided whether it really serves the interests of the human race, of the consumer, by securing more and better food, or is it serving only the interests of the manufacturer, the food processor and distributor. Its use should be permissible only if it increases the yield, protects crops and animals against diseases, protects food products against too fast deterioration, improves its nutritional value, and so forth. The addition of chemicals, however, which only improve appearance, facilitate the use of cheaper ingredients, or prolong, for example, the shelf life of bread, should be discouraged.

I had a personal experience in this connection when several years ago I discouraged the addition of monosodium glutamate to canned tuna. As we do not know how this substance behaves under the high pressure and temperature of retorting, and as it does not improve the nutritive value of the product, I found it objectionable to add glutamate to the canned fish solely for advertising purposes.

If the use of such substances is permitted, the label—and I mean also the label of the bread—and any other label, I may add—should indicate not only the name and quantity of the chemical, but also the reason why such substance has been added. It is then up to the customer to decide whether he prefers this or the other product which is somewhat less appealing—the bread which is not extremely soft but at the same time does not carry the possible hazards of admixed chemicals.

The main criterion for the addition of a substance to food should be in all instances the reasonable proof of safety. The manufacturer should provide experimental proof that substances produced with the intention of use in any phase of food production are by themselves harmless in the applied concentration and that their incorporation into food does not interfere with digestion, utilization, or the nutritive value of the finished product. Some of the large industrial organizations have facilities to perform such tests and smaller processors may utilize the services of good industrial laboratories.

The experimental proof indicating such safety should be submitted by the manufacturer or food processor to a food council—a panel of experts on the territory of human nutrition, medicine, pharmacology, biochemistry, and food technology. Because the problems involved are so complex, and as the health of millions may depend on their decision, such a panel should be composed of experts who have distinguished themselves in their special fields. They should be employed on full-time salary to give them the opportunity to study the problems and the literature thoroughly. The members of such a council should be nominated by the National Research Council.

The opinion of this food council should be used by the Food and Drug Administration in permitting or prohibiting the use of the product. The Pure Food and Drug Act could be accordingly amended. The licensing of pesticides and fertilizers should be also coordinated for most effective protection of the food consumer.

We often hear the objection that by such involved and time-consuming procedures industrial research may be discouraged and progress hampered. The experience in the drug field proved the opposite. Quacks, so-called bathtub drug manufacturers, irresponsible profiteers, dropped out since 1938 from the business, but the research activities and the achievements of the drug business as a whole shows recently an unprecedented development.

Credit has to be given to the food and allied industries for improvement of the nutritional conditions through research and its practical application. But even so, we have to be protected by legal means not only against irresponsible elements, but also against the possible involuntary mistakes of the reputable food producers.

(Dr. Geiger's biography is as follows:)

BIOGRAPHY OF ERNEST GEIGER

Born: Muraszombat, Hungary; May 31, 1896.
United States citizenship: 1945.
M. D., 1921: University of Graz, Austria.
M. D., 1923: University Pecs, Hungary.
Ph. D., 1947: University of Southern California.
1921–22: Resident Assistant, University of Graz.
1922–36: Assistant, later privatdozent, then professor eo. of experimental pathology and pharmacology medical faculty, University of Pecs.
1936–38: Director of research, Gedeon Richter, Ltd. (Budapest-London).
1939: Associate professor of pharmacology, Chicago Medical School.
1940–48: Director of research, and since 1948, adviser in nutrition and pharmacology, Van Camp Sea Food Co., Inc., Terminal Island, Calif.
1947–: Professor of pharmacology and toxicology, Medical School, University of Southern California.
1950–: Consultant in pharmacology, Los Angeles County General Hospital. Associate Food and Container Institute Quartermaster Academy Applied Nutrition.
Member of: Biochemical Society (London), Institute of Food Technologists, American Chemical Society, American Pharmaceutical Society, Society of Experimental Biology and Medicine, Phi Kappa Phi, Sigma Xi, Institute of Nutrition.
Fellow of: American Association of Advanced Science.
Chairman for 1948–49 of Southern California Section of Society for Experimental Biology and Medicine, and Southern California Biochemical Society.
1951: Specialist in human nutrition—certified by the American Board of Nutrition.
Eighty research papers published in scientific journals.

Dr. HEDRICK. A very fine statement, Doctor; a very fine statement.

Do you have any questions, Mr. Jones?

Mr. JONES. Just one question.

When you mention that you advise against the use of monosodium glutamate in canned tuna——

Dr. GEIGER. Yes.

Mr. JONES. That you found it objectionable to add monosodium glutamate to the canned fish solely for advertising purposes, in their advertising what did they claim it did?

Dr. GEIGER. The only claim which could have been made is that glutamate was added and the flavor improved.

Mr. JONES. I mean the manufacturer or canner, he would not merely say that this tuna fish has monosodium glutamate added.

Dr. GEIGER. No. I didn't want to discuss the statement on the label. I wanted to stress the philosophy behind it, that no substance should be added to the food product which does not improve the nutritive value.

Mr. JONES. You mention, though that he should not say that that would add to the flavor. In the opinion of some people would the flavor of tuna fish be improved through the addition of monosodium glutamate?

Dr. GEIGER. I think that it is very difficult to answer such a question, because I know at some laboratories in Chicago they have conducted expensive and time-consuming experiments in order to determine whether something is a little more palatable or less palatable, without conclusive results.

Mr. JONES. That is what I am getting at. In other words, in your opinion would the addition of monosodium glutamate have any deleterious effect on the consumer?

Dr. GEIGER. That is what I don't know.

I have here a little booklet on monosodium glutamate with me, and it scared me a little bit. This is a monosodium glutamate symposium which was published by the Quartermaster Food and Container Institute.

Mr. JONES. Would you please identify it for the record?

Dr. GEIGER. It is entitled, "Flavor and Acceptability of Monosodium Glutamate," proceedings of the symposium, March 4, 1948, the Stevens Hotel, Chicago, Ill.; sponsored jointly by the Quartermaster Food and Container Institute for the Armed Forces, and Associates, Food and Container Institute.

Mr. MCDONOUGH. Monosodium glutamate is known to the trade as Accent?

Dr. GEIGER. And I think there are other trade names also.

Mr. MCDONOUGH. There are others. What other trade names are there?

Dr. GEIGER. I don't know. I have seen some others, not only Accent here.

Mr. MCDONOUGH. All right.

Dr. GEIGER. Here on page 44 Dr. Fellers, who was at this time, chairman of the food technology department at the University of Massachusetts in Amherst, Mass., says:

> Heat and processing change the flavor of monosodium glutamate somewhat but do not usually produce off or undersirable flavors.

Then on the next page he makes a statement:

> A canning process of 240° to 250° Fahrenheit definitely does something to the flavor. In some cases it improves it; in some cases it makes it inedible. The only way to know is to try it out.

And then on page 66 there is a statement by Dr. Melnick:

> Thus in supplementing a heat-processed food with a free amino acid, a reactant that is normally present in very small amounts would be added in concentrations capable of increasing the browning reaction to a noticeable degree.

So something happens.

We know that free amino acids or proteins, heat processed with sugar or some other amino acids, undergo chemical reactions which may impair the digestibility; it does not have to destroy the product

but it may interfere with the digestibility of protein and the absorption of some of the amino acids.

If there was no positive value to it, I didn't think we should spend our time and research facilities to determine what happens to the monosodium glutamate in the heat process. I would not object to its use at all. I mean it is free to any customer to try either brand you mentioned, or some other product of monosodium glutamate and just put a little on the canned fish before he eats it.

Mr. McDonough. In other words, you don't object to it?

Dr. Geiger. Not at all.

Mr. McDonough. You think the public should be advised as to what the effects may be from using it?

Dr. Geiger. No; not at all. I just object to adding chemicals to food when you can't prove that there may derive some positive value from its addition.

Mr. McDonough. Then you object to the addition of bread softeners to create a soft loaf of bread but which does not add to the nutritive value of the bread?

Dr. Geiger. Yes; I would. There are some other ways. For instance, the use of milk products for the same purposes.

Mr. Jones. Doctor, following your statement, would you say that the manufacturer or packer should not put salt or sugar into a product if it was not used for the purpose of a preservative? If they were adding it merely for flavor, you would discourage the use of that?

Dr. Geiger. For instance, salt I wouldn't.

Mr. Jones. What?

Dr. Geiger. I wouldn't object to salt. But, for instance, I would discourage the addition of sugar to some products, because we know that on heating sugars with proteins the value of the protein may decrease.

Mr. Jones. You say adding a chemical. Of course, salt is a chemical.

Dr. Geiger. I wanted to make this statement, everything we may add is a chemical.

Mr. Jones. Yes.

Dr. Geiger. But I think we know well what we are talking about when we are adding a small amount of sodium chloride, which is an inorganic compound, to food. At least, we may not do some damage. But when we add free amino acids or sugar compounds which react at high temperatures, with proteins, then I would be cautious at least.

Dr. Hedrick. Doctor, do you believe that the bread softeners are injurious in any way?

Dr. Geiger. I don't know.

Dr. Hedrick. I think we have had some testimony before this committee they have been considered injurious and should not be used.

Is that not correct, Mr. Kleinfeld?

Mr. Kleinfeld. Apparently there is some difference of opinion.

Mr. Jones. This witness said he does not know.

Dr. Geiger. There are differences of opinion on concentrations, and so forth, which were used in experiments by the two groups who didn't agree.

Mr. McDonough. A wide difference.

Dr. Geiger. A very wide difference. So it would be very hard by just reading the reports to form any opinion in this connection.

Dr. HEDRICK. Any other questions?

Mr. MCDONOUGH. You are familiar with Dr. Carlson's studies at the University of Chicago?

Dr. GEIGER. Yes.

Mr. MCDONOUGH. He is a very practical man. He believes in natural foods.

Dr. GEIGER. Yes.

Mr. MCDONOUGH. And the very cautious use of anything that would affect the nutritional value?

Dr. GEIGER. Yes.

Mr. MCDONOUGH. Do you think his opinions are too radical, or do you agree generally with his philosophy?

Dr. GEIGER. I think I agree generally there with his philosophy, but I question whether this philosophy can be transferred into practicality——

Mr. MCDONOUGH. Here we have an increase in population, a tremendous volume of food consumed.

Dr. GEIGER. That is right.

Mr. MCDONOUGH. And various methods of transportation and storage, various methods of concentration of foods in various forms.

Dr. GEIGER. Yes.

Mr. MCDONOUGH. All of which require something to keep them in edible form and sanitary condition.

Dr. GEIGER. That is right.

Mr. MCDONOUGH. Now, in considering all of those problems on such a broad scale, you do not object to the use of certain chemical additions that will give the public the volume that they are demanding if the additions do not seriously affect them in the consumption of these materials, or do you?

Dr. GEIGER. No; I wouldn't object.

Fifty or one hundred years ago people had to go out hunting, fighting, in order to provide food. So there was always a risk of life connected with securing sufficient amounts of food. And when the hazard of chemicals is not too big, then I think the experts should decide whether such risk should be taken. If we would eliminate agricultural pesticides and technicological methods of the present and would go back to those of a hundred years ago I don't think we could provide our population with enough and satisfactory food.

Mr. MCDONOUGH. Of course not. Whatever we are doing, we are certainly not reducing the longevity, we are increasing it, according to the statistics. These show that man's span of life has increased about 20 years in the last 75.

Dr. GEIGER. Dr. Pottenger brought out the problem of fast growing of the children. I was very much interested in it, because a few days ago Dr. Harris, director of the Nutritional Laboratory in Cambridge, Mass., showed a curve by which he wanted to demonstrate by the better growth of boys and girls, the beneficial effect of nutritional research.

Mr. MCDONOUGH. That is all, Mr. Chairman.

Mr. JONES. One other question.

Do you not think it would be impossible to provide adequate diet to the 150-million-odd people of this Nation if we followed the philosophy and what I would call the impracticable recommendations of Dr. Carlson?

Dr. GEIGER. I have such a high regard for Dr. Carlson that it is very hard for me to answer the question. Practically, I think with today's food condition and nutritional problems I would probably not accept 100 percent, his recommendation.

Mr. JONES. That is enough.

Mr. KLEINFELD. I have no questions.

Dr. HEDRICK. With regard to estrogenic hormone face creams, how do you feel about that?

Dr. GEIGER. I had some experience with this problem when I worked in the pharmaceutical field, and I recall that there was a lawsuit between one of the producers of the cream and some medical association.

Dr. HEDRICK. I remember that.

Dr. GEIGER. I think at this time nobody was able to prove that this cream may produce cancer. In the meantime it was found, at least some people claim it in the literature, that existing cancer may grow faster from the use of these hormones. That is about all I would say.

Dr. HEDRICK. As far as you know it doesn't absolutely produce cancer?

Dr. GEIGER. No; there was no proof. I have reviewed the literature on it. In a certain strain of rats you can do it, but that just shows that it has to be used judiciously in human beings.

Dr. HEDRICK. I guess that is all, Doctor. Thank you for coming before the committee.

Dr. GEIGER. Thank you.

Dr. HEDRICK. Who is your next witness, Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Deuel.

(The oath was administered by the chairman.)

TESTIMONY OF HARRY J. DEUEL, JR., PH. D., DEAN, GRADUATE SCHOOL, UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES, CALIF.

Mr. KLEINFELD. Doctor, what is your academic background? Do you have it all set forth in your statement?

Dr. DEUEL. Yes; I have.

Mr. KLEINFELD. Will you please read your statement?

Dr. DEUEL. My name is Harry J. Deuel, Jr. I am dean of the graduate school of the University of Southern California, and also have the appointment as professor of biochemistry and nutrition at the University of Southern California, School of Medicine, which position I have occupied since 1929. I received my B. A. degree at Carleton College in 1918 and a Ph. D. degree in biochemistry under Prof. Lafayette Mendel at Yale University in 1923.

I served as an instructor and later as assistant professor of physiology at the Cornell University Medical College in New York City from 1923 to 1928, and later for 1 year as professor of physiology at the University of Maryland Medical School in Baltimore. Since that time I have been at the University of Southern California. Other experience includes a 3-year period, from 1917 to 1920, with some time out for the war, in the Department of Agriculture in Washington, D. C., during which time I assisted in experiments carried out to determine the digestibility of various fats. In fact, since 1917, my chief interests have been in research on fats. I have written about

220 scientific articles which have been published in such journals as the Journal of Biological Chemistry, American Journal of Physiology, Journal of Nutrition, Archives of Biochemistry, and a number of such publications. Most of these papers have reported experiments on the subject of metabolism and nutritive value of fats. The thousand-page volume on The Chemistry of Lipids, under my authorship, will be off the press about November 15 of this year. I have not seen it yet but it is supposed to be off. The second volume on The Biochemistry of Lipids is now in preparation.

I am a member of a number of scientific societies, including the American Institute of Nutrition, American Society of Biological Chemists, the Biochemical Society of Great Britain, the American Physiological Society, the Society for Experimental Biology and Medicine, Institute of Food Technologists, of which I currently am the chairman of the southern California section, the American Chemical Society, American Oil Chemists' Association, and such honorary societies as Phi Beta Kappa, Sigma Xi, Phi Kappa Phi, and the Harvey Society. I am a member of the Liaison and Scientific Advisory Board of the Quartermaster Food and Container Institute for the Armed Forces. I also serve on the editorial board of the Annual Reviews of Biochemistry and am a member of the board of directors of Annual Reviews, Inc.

I received the Borden award given by the American Institute of Nutrition in 1949. At the present time, I have an extensive research program under way, which is being supported by a number of organizations. This includes the Atomic Energy Commission, the Cardiovascular Section of the United States Public Health Service, and such food concerns as the Best Foods, Inc., Procter & Gamble, Lever Bros., Swift & Co., Barnett Laboratories, and others. Research done under all these grants is related to work on fats. I appeared last spring over an extended period before the Food and Drug Administrations at their hearings on a question of change of standards of identity for oleomargarine. The work reported there is of considerable interest in relation to the use of chemicals in foods.

I am very much in favor of testing any new chemical before it is used in food, in order to check the safety of its use. It is imperative that the American public be given this protection so that they will not consume foods that may be in any respect deleterious to them. On the other hand, it is important that the food producers be given encouragement to use such chemicals as may serve a valuable function for the consumer, provided, of course, that they do not in any way conceal inferiority or that they do not lessen the nutritional value of the product in question. For example, the use of antioxidants to slow down the process of rancidity in fat, serves a dual purpose. First, it assures the consumer of obtaining a sweet fresh product, and secondly, it increases our national wealth by preventing the loss of edible food products.

Mr. McDonough. What are those antioxidants you are referring to?

Mr. Deuel. Things like tocopherol, NDGA, quite widely used, gum guaiac, which is used by Swift & Co. There are 30 or 40.

Mr. McDonough. What quantities compared to the volume?

Dr. Deuel. Extremely small amounts—two one-hundredths to one-tenth of 1 percent, something in that nature.

Mr. McDonough. Not enough to reduce the nutritional value at all?

Dr. Deuel. No.

The extent of testing that is necessary depends on the nature of the chemical proposed, and should be a matter of judgment of competent scientists. The analysis of results likewise should be referred to scientists who are specialists in the field. Where there are any analogies to indicate that the substance might have some toxicity, then much more exhaustive tests are necessary than in the case of substances which, by their chemical formula and structure, would be expected to be innocuous. When compounds occur naturally, either in the animal or human organism, one might very well assume that such a compound would not be harmful. But even here, I should like to point out that one should base judgment on the question after the amount of the component which it is proposed to use is taken into consideration. Thus, a common substance such as salt or even water can serve as a poisonous agent if it is forced on an animal or on man in a sufficiently large quantity.

To illustrate these points more completely, I should like to refer to studies of two antiflavor reversion agents which have recently been proposed for incorporation in fat. Information on the safety of these compounds was presented to the Food and Drug Administration hearing last spring. The first of these substances is isopropyl citrate. In this case, the isopropyl citrate is made up of isopropyl alcohol and citric acid. One does not need to worry about the toxicity of isopropyl alcohol in the quantities used since it is many times below that which could have any pharmacological effect and isopropyl alcohol has properties quite similar to those of ordinary ethyl alcohol. Moreover, citric acid is a natural component of the body which is constantly being produced from sugars and it is also known to occur in many natural products. There is no question of toxicity of this substance even in extremely large amounts. Therefore, it was only necessary to prove whether the combination of citric acid and isopropyl alcohol, namely the ester, isopropyl citrate, exhibits any properties other than those possessed by the components of which it is composed. In the case of this ester, we were unable to show any toxic reaction by any of a variety of procedures even when the material was given at extremely high doses.

The second substance which we studied was stearyl citrate, which is composed of stearyl alcohol and citric acid. There is very good evidence in the literature that stearyl alcohol is a normal constituent which can readily be formed from stearic acid. It has already been shown that citric acid itself is a normal component. Here again it was only necessary to obtain evidence that the new compound, namely the ester, stearyl citrate, does not possess any harmful effects and that it is as innocuous as the components which make it up.

There are a number of ways by which any new chemical should be tested. In the first place, when the product is prepared by a commercial laboratory or when it is obtained from some other source, the laboratory responsible for the toxicological study should determine the purity of the product used in the tests.

It seems to me that is very important because somebody might submit a product to the laboratory and state what the substance was. If the laboratory proceeded with the tests, and did not determine

what substance they were investigating it might have been just sugar, salt, or something like that. In our own tests we establish the composition of practically every shipment of material that is sent to us.

In the feeding tests, one should first carry out acute experiments on rats and one other species in which the material under the test is fed at several different levels—one of which is relatively high—to determine whether any toxicity can be demonstrated. In the case of the products which we tested, using the short-term acute experiments—that is 6-weeks tests—no toxicity could be shown but there still was the possibility that the continued ingestion of this material over a long period of time—as would occur when it was regularly ingested in a food—might bring on effects not evident in the short 6-week acute tests. Therefore, it is imperative in this kind of testing that the most weight be given to chronic tests which extend over a long period of time.

There are several ways in which the chronic testing can be done. The usual way involves feeding the material at several levels, one a fairly high one, over the major portion of the life cycle of the test animals, and comparing the effects of such administration on growth, well-being of the animal, and longevity. These tests, in our own experiments with rats, lasted something over 2 years. At the conclusion of the experiments, a number of the tissues, such as the liver, kidneys, heart, stomach, intestine, and several other organs should be removed and sent to a pathologist for a histopathological examination. In our tests, these included tissues from both the control group and from the experimental group receiving the highest level of test material. The tissues from the animals which had received the intermediate and lowest doses were held in a fixative in reserve so that they could be examined later in case any injury was noted in the histopathological examination of the tissues from the animals receiving the highest dose.

It has been our practice in such cooperative work with the pathologist, to supply the tissues under a code number, simply indicating that there are two groups of experiments, one from control animals and one from a group of test animals, but not indicating until the report was made which group is which. In the hearings on the isopropyl and stearyl citrates at the Food and Drug Administration, our pathologist testified on these results in person.

Mr. McDonough. What, in your opinion, is the relationship of the effect of a poison on a test group of rats and on the human system?

Dr. Deuel. Well, in most cases, if a substance were a poison it would show up in the rat just the same as it would show up in the human. There are some differences, but in general, if we go through the series of substances we recognize as poisons, we will find that they are poisonous not only to man but to the dog and the rat and any animals that have a similar gastronintestinal system.

Mr. McDonough. That may apply to poisons, known poisons?

Dr. Deuel. Yes.

Mr. McDonough. How would it apply to these things that are questionable as far as their poisonous effects are concerned—that are merely deleterious, not poisonous? Anything may be poisonous. You can inject too much water into the system and it will become poisonous, or too much salt. That is an extreme example. Let's distinguish between poison and what may be deleterious.

Dr. DEUEL. We have no way to judge or to determine except on an animal like the rat. If a substance is deleterious, it should show up in an experiment on the rat where you compress the life span from 75 years to 2 years or 3 years.

It would be impossible, for example, to carry out experiments on human subjects and demonstrate what one can do on rats. In the rats for example one can carry out such critical experiments over five generations, and these are especially revealing since any deleterious effect piles up.

Mr. MCDONOUGH. Yes.

Dr. DEUEL. And I think we can say that things that are poisonous or deleterious to man are also poisonous or deleterious to rats in general. There may be differences in the quantitative level responsible, but when you feed 100 or 500 times the level you should avoid any such difficulties in rat experiments.

Mr. MCDONOUGH. Is the rat the best animal to compare with man?

Dr. DEUEL. It is my opinion it is the best animal because of the fact you can make more extensive experiments. You can carry—let me start over again.

Mr. MCDONOUGH. Even the monkey?

Dr. DEUEL. The monkey is fine, but you can only do a limited number of experiments, and from an economic standpoint it is entirely nonfeasible to try to carry on experiments over a number of generations. We have to accept the rat because it is the common laboratory animal, and there are occasions where we have shown ourselves that some qualitative differences exist between rats and man in digestibility but the differences are slight, and it is a quantitative rather than a qualitative difference.

Another type of chronic experiment which is extremely important is what we have called the multigeneration experiment. This consists in feeding a group of animals a test diet from weaning, breeding them when they are mature while on the test diet, and then continuing their progeny on such diets and breeding the latter group at the appropriate time. This routine can be completed through four or five generations in a 2-year period. Substances which may have no deleterious effect when fed in a relatively large amount to adult animals over short periods, or which may not slow down the rate of growth when given to weanling animals, may have a harmful effect on pregnancy or on lactation, especially when continued over several generations. When it can be demonstrated that there is no slowing down in the rate of growth over four or five successive generations in animals receiving a test substance over that which occurs in animals which receive the same diet without the test material, and when it is shown that the fertility index and lactation performance, as determined by the weight of the weanling rat, remain equally high, then one has excellent evidence for the harmlessness of the particular substance under consideration.

In this interpretation of the effects due to species variability, the Food and Drug Administration has suggested the use of at least three species, one of which is a nonrodent. In the studies which we have made, we have carried out experiments on rabbits at fairly high levels and have likewise performance feeding tests on puppies. In both of the latter species, the tissues were examined by a pathologist after the animals had been sacrificed at the conclusion of the test. If

all the tests on an animal like the rat have given uniformly negative results, then it is my opinion that the tests on the other two species may be largely confined to acute tests over a fairly short period of time, but with the administration of fairly large amounts of the test material.

In most cases, toxicologists consider that the determination of the LD–50 is of considerable importance. This is the amount of the substance which will result in the death of 50 percent of the animals. In the case of many substances, it is impossible to administer sufficient material to bring about death because of the mechanical difficulty in getting a large enough amount of material in the stomach at one time. In our own tests, we found no difference between the effect of our material when fed in high concentrations in fat and the effect of fat alone. This was because of the fact that it was necessary to give such extremely large doses that the animal did not have the physical capacity to take care of such a great bulk of material.

It would seem to me that if the tests which we have listed here all show negative results, one may be certain that the substance is nontoxic when used in the amount under consideration. If there does appear to be some evidence of harmful effects, then a further study as to the cause of such effects, a more exact evaluation of how much of the material is required to produce such toxicity, and further studies on the metabolism of the product may be necessary. Because of our interest in fats, we included in our study the effect of these two citrates on the rate of absorption and the completeness of digestibility of fats.

The committee might be interested in seeing an extremely condensed report of the experiments carried out on the citrates, which has recently been published in two papers in Food Research. And I have these here, which I will give to the committee as soon as I locate them, if you are interested in incorporating those. Although these are quite condensed, they do, however, contain almost all of the essential data which should be needed for reaching an evaluation of any possible toxicological effects of such compounds.

I might say that when I discussed with Dr. Lehman about how he wanted the data presented, which was a big thick volume like this [indicating], he said, "Well, if you can get this stuff published, all we are interested in is simply a reprint of the work," and that is what these are—very greatly condensed.

I have just recently seen a copy of the proposed order of the Food and Drug Administration to amend the margarine standard published in the Federal Register of October 13, 1951. Whereas they have allowed the use of monoisopropyl citrate, they have refused the use of distearyl citrate. Such refusal apparently has been made not on the basis of the demonstration of any toxicity whatsoever, but largely on our report that the digestibility of margarine was lowered when fairly large amounts of this product were added to it. However, it had also been shown that in margarine containing 0.15 percent of stearyl citrate, no lowering in digestibility results. This corresponds to 0.52 percent on the fat or almost three times the level recommended for inclusion in margarine for the antiflavor reversion action. Furthermore, the results of absorption experiments on rats, where stearyl citrate made up 5 percent of the fat, gave no evidence of any depressing effect of the ester on fat utilization. This percentage is over 25 times the recommended level for addition of this compound to margarine.

There is a direct proportionality in the rate of absorption and the extent of digestibility so this type of experiment is directly applicable in the present discussion. Finally, in tests on dogs, where 3 percent of stearyl citrate was included in the diet—or 14.8 percent of the fat—no lowering in digestibility of the fat obtains. This is 75 times the level of proposed usage. For digestibility, I would consider a factor of 2 as entirely satisfactory. I mean that if twice the level, the materials had no effect, I would think it was perfectly satisfactory because that is not really an index of toxicity. This value was shown to exceed 26 in the rat and 75 in the dog. Furthermore, it was shown that the chief reason for the reduction in digestibility on rats when stearyl citrate was incorporated in very large amounts was due to the fact that stearyl citrate increased the melting point of the fat; therefore, we merely had an artifact. Accordingly, considering all the facts, it is clear to you, or we hope it is, that the Food and Drug Administration was wrong when it held that stearyl citrate should not be permitted for use.

I think we all may have a legitimate concern about giving the Food and Drug Administration the entire responsibility to pass on the sufficiency of testing and the conclusions to be drawn from the testing prior to the use of a new chemical in food. Although the conclusions of this group are usually correct, I am convinced on the basis of the ruling on stearyl citrate that they also make mistakes. It would seem to me that in the future where a disagreement arises, a possible recourse would be to submit the data to a group of scientific men who have the ability to judge the scientific merit of the work, and that they should be given the final say. The method by which such a group would be chosen would, of course, have to be satisfactory to both the Food and Drug Administration and to the manufacturer whose product was under discussion.

The pattern followed by the United States Public Health Service in leaving recommendations for grants to their study sections has much to commend it. Each group consists of specialists in certain fields with wide geographical distribution who are willing to contribute several days of their time—gratis, I might say—each year to such a duty.

Dr. HEDRICK. Without objection, these two pamphlets will be inserted in the record.

Mr. KLEINFELD. Do you want them inserted physically or put in the files?

Dr. HEDRICK. I think they are valuable and not too heavy. Whatever you believe.

Mr. JONES. They are available, and we can get extra copies?

Dr. DEUEL. I have a limited number but I could supply the committee with a half a dozen.

Dr. HEDRICK. They seem very valuable to me. We should have them in our files.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. No questions.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. I think it is a very valuable statement you have made, Dr. Deuel. I do have one question.

We have heard from experts in other parts of the United States, and the question always remains in my mind whether these animal tests

are sufficient to give the public the assurance that the human being reacts in the same manner with the animal that is being tested.

Dr. DEUEL. Well, I think you can probably never get enough information to always be entirely certain, because there might be one chance in a million that the material might have a different effect in man than it did in the rat.

One, however, has gotten around that partly by using three different animals, one of which is a nonrodent. That is the first thing.

In the second place, I think one gets around it by carrying on these tests with levels of materials far in excess of the maximum which could ever be used. Such differences, if they occur, as I stated before, I think are quantitative rather than qualitative. That is maybe five parts would be toxic to a rat and it might take only two parts for a man. But at least if you have a hundredfold difference in the level tested and the maximum which is to be used, then you pretty well have covered up that possibility.

Mr. MCDONOUGH. That is all.

Dr. HEDRICK. Mr. Kleinfeld?

Mr. KLEINFELD. Dr. Deuel, on page 1 of your statement you said you appeared last spring before the Food and Drug Administration at the hearings on the question of proposed changes in the standard of identity of oleomargarine. You appeared there on behalf of a manufacturer of margarine?

Dr. DEUEL. I appeared there on two counts. I appeared, No. 1, for a local laboratory here, the Barnett Laboratories, and also the Best Foods, to discuss the possibility of the use of carotene as a source of vitamin A in margarine. And there was no question on that, and that was adopted.

In the second portion I appeared on behalf of the Best Foods in relation to isopropyl and stearyl citrates. I had had a recent grant from them in which over a period of about 5 years we had carried out in our own laboratories the tests recorded in these two papers.

Mr. KLEINFELD. Are you familiar with section 401 of the Food and Drug Act?

Dr. DEUEL. I might be familiar with it but not by that number.

Mr. KLEINFELD. Well, that section provides that in connection with definitions and standards of identity for foods, Congress has told the Food and Drug Administration that optional ingredients shall be permitted when the addition will promote honesty and fair dealing in the interest of consumers, not manufacturers.

Now, in the case of the second substance you mentioned, stearyl citrates——

Dr. DEUEL. Yes.

Mr. KLEINFELD. The Food and Drug people disagreed with you, did they not?

Dr. DEUEL. Yes.

Mr. KLEINFELD. And you say they were wrong?

Dr. DEUEL. I say they were wrong, they didn't have experts who knew what I was talking about. That was one thing. And they didn't understand the difference between digestibility experiments and absorption experiments.

Had I had a group of people trained in nutrition work, they would have understood such differences, but there was nobody from the Food

and Drug down there except the legal counsel and one other man at the time I gave my testimony, and I don't think that there was really anyone adequately trained to ask the correct line of questions. I think the questions which were asked were somewhat inappropriate.

Mr. KLEINFELD. You mean there were just lawyers there?

Dr. DEUEL. There was one man from the Food and Drug Administration, as I recall, at the time who coached the lawyer on what to ask.

Mr. KLEINFELD. What was his name; do you remember?

Dr. DEUEL. Well, at one time it was Mr. Calloway. Mr. Calloway is a fine man, but he didn't understand the type of thing that was being reported here.

Mr. KLEINFELD. Don't even scientists disagree with each other once in a while?

Dr. DEUEL. Oh, surely.

Mr. KLEINFELD. And sometimes we don't know who is wrong or right, do we?

Dr. DEUEL. No.

Mr. KLEINFELD. For example, in the standard for oleomargarine the Food and Drug Administration permits as an optional ingredient artificial coloring. Is that correct?

Dr. DEUEL. Yes.

Mr. KLEINFELD. And sodium benzoate, vitamin A, and the artificial flavoring diacetyl; is that correct?

Dr. DEUEL. Yes.

Mr. KLEINFELD. And mono- and di-glycerides?

Dr. DEUEL. Yes.

Mr. KLEINFELD. And lecithin?

Dr. DEUEL. Yes.

Mr. KLEINFELD. Are you familiar with the release from the Food Protection Committee of the National Research Council of June 11, 1951?

Dr. DEUEL. On mono- and di-glycerides?

Mr. KLEINFELD. Entitled "Statement On the Use of Surface Active Agents in Foods."

Dr. DEUEL. I have not read as such that concerning mono- and diglycerides. I know of the statement. I haven't read it.

Mr. KLEINFELD. Let me read some parts of it to you:

The Food Protection Committee has reviewed the evidence placed before it by several groups interested in the use of surface active agents in the manufacture of ice cream. It is the judgment of the committee that it is not possible to consider the use of such agents in one food, such as ice cream, without simultaneously considering the estimated consumption level of such compounds in the diet from all foreseeable sources.

The agents considered may be divided into two groups: The mono- and di-glycerides of fatty acids and the esters of nonglycerol alcohols. These latter include the complex esters and ester-ethers of the hexahydric alcohols and alkylene oxide and fatty acids. All of these may alter important physiologic processes due to their common property of altering interfacial tension. In addition, the nonglycerol esters present the added problem of the metabolic fate and possible toxic effects of the nonfatty acid moiety. Finally, there exists the consideration of a pharmacologic effect within the body of the absorbed intact compound.

Most preparations of these substances are mixtures characterizable only by means of various constants. Blends of the products are oftentimes recommended for use in foods. These facts make it necessary that data be available on both the individual members of the groups and upon blends proposed for use in foods.

Then the Food Protection Committee of the National Research Council said this:

> With these points in mind it is our considered opinion that the data available to us on the toxicity, tolerance, metabolic fate, and nutritive value of these surface active agents proposed for use in ice cream are insufficient to permit a final judgment as to the safety of the substances for use in foods.

In view of the findings do you think we ought to continue using the mono- and di-glycerides? For example, in margarine?

Dr. DEUEL. I see no reason why we should not. After all, there is very good evidence that mono- and di-glycerides are set free in the small intestine during digestion.

I have seen several very carefully conducted experiments where mono- and di-glycerides were fed in fairly large amounts in place of fat, with no evidence of any differences whatsoever in nutritional value. They have been used for many years in shortenings, and simply by the "grandfather clause" there probably is no reason to suspect them, and they should be included, I should think.

Mr. KLEINFELD. To that extent you disagree with the Food Protection Committee of the National Research Council?

Dr. DEUEL. I realize pressure has been brought on them because of the fact that the other esters, sorbitans, and so forth, have been excluded. But I don't think that means that mono- and di-glycerides are harmful. I have no such feeling whatsoever.

Mr. KLEINFELD. As a matter of fact, in a subsequent statement by the same organization the conclusion was reached that:

> The statement was not intended to question the continued use in food of surface active materials that are permitted by existing or officially proposed standards of identity.

In any event, you would not reach the conclusion that the data available in this country on the mono- and di-glycerides were insufficient to permit a final judgment as to the safety of the substances, is that correct?

Dr. DEUEL. Yes; that is correct.

Mr. KLEINFELD. In other words, people, even scientists, differ with each other from time to time?

Dr. DEUEL. Surely.

Mr. KLEINFELD. Now the Food and Drug Administration, in the margarine standard, did permit the use of mono- and di-glycerides; is that correct?

Dr. DEUEL. They did that some time ago. That was in 1941, I believe.

Mr. KLEINFELD. You agree with them in that respect?

Dr. DEUEL. There was no evidence at that time of any deleterious effects. They had been used for a number of years, and I think they are perfectly safe.

Mr. KLEINFELD. You believe they were right then and right now in connection with the glycerides, but wrong now in connection with the citrate preparation?

Dr. DEUEL. Yes.

Dr. HEDRICK. What is your opinion of estrogenic hormones with regard to causing cancer?

Dr. DEUEL. I have had no experience. I am sorry.

Dr. HEDRICK. What do you think?

Dr. DEUEL. My opinion is they do not cause cancer. I think what Dr. Pottenger and Dr. Geiger said are perfectly true statements of the case: They may speed up the rate of development but they certainly do not cause cancer.

Dr. HEDRICK. That is fine. Thank you very much.

We will stand adjourned for 1 hour.

(Whereupon at 12:45 p. m. the committee recessed to reconvene at 2 p. m.)

AFTERNOON SESSION

(The committee reconvened at 2 p. m. pursuant to the luncheon recess.)

Dr. HEDRICK. The committee will please come to order.

(The following statement was inserted in the record:)

STATEMENT OF R. H. ROBINSON, CHEMIST, OREGON EXPERIMENT STATION, OREGON STATE COLLEGE, CORVALLIS, OREG.

Mr. ROBINSON. My name is R. H. Robinson. I am chemist (professor) at the Oregon Agricultural Experiment Station, Oregon State College, Corvallis, Oreg.

I have been connected with Oregon State College since 1911 as a research chemist in the agricultural experiment station. For the first 10 years my work consisted mainly in chemical studies pertaining to various agricultural problems including insecticides and fungicides. About 1922 pesticide problems became more important and since then I have devoted most of my time to this line of research. These investigations included studies of chemical properties and compatibility of various insecticides and fungicides; softening treatment of spray combinations to prevent injury to plants; formulations of the different spray chemicals to give most effective control of the pests; chemical analyses of spray deposits on plants to learn how much residue adhered and the amounts that remained on fruit at harvest; and spray residue removal studies. My work has taken me out in the field and in packing houses and canneries. There I have observed application of pesticides on fruit and vegetable crops by ground machinery and airplane. In packing houses I have assisted in adapting cleaning methods with different solvents and detergents for various crops.

In 1923 I drew up the Oregon Economic Poisons (Pesticides) Act and supervised its enforcement until 1931 when the State department of agriculture was formed and took over enforcement of all agricultural laws. During 1928–29 and 1934 I was connected with the Insecticide Division of the United States Bureau of Entomology and Plant Quarantine doing special investigational work. When the United States Food and Drug Administration declared tentative tolerances for arsenic on apples and pears in 1926 I cooperated in the development of the hydrochloric acid and other cleaning processes for the removal of spray residues. Since then and because most of Oregon's agricultural products are shipped into interstate commerce, I have devoted a large part of my time to mechanical and chemical means of removing various spray residues from our food crops in order to meet tolerances set by the Government.

STATEMENT REGARDING PESTICIDES AND THEIR RESIDUES ON FOOD CROPS

This discussion has to do only with those pesticides, namely, inorganic and organic chemical compounds and botanicals that are used by the agricultural industry for the control of pests that destroy various food crops. The term "pesticides" which includes insecticides that are employed for the control of insect pests and fungicides that are applied to check the ravages of plant diseases will be used in this discussion.

Pesticides are necessary and must be used to control insect pests and plant diseases for the production of a dependable supply of food. The voluminous testimony given by State and Federal entomologists and plant pathologists and others at the spray residue tolerance hearings in Washington, D. C., this year 1950 has definitely established this need and no further comments are necessary to emphasize their importance. The testimony also emphasized the need of a continuous flow of new pesticides from industry as well as from State and

Government research agencies to meet rapidly changing conditions. Many pests have increased to such proportions that effective control of them could not be accomplished today if there were available only those pesticides in common use before World War II. Consequently, no unnecessary legal barriers should be erected to discourage or slow down research activities in the search for new and more effective products.

Most pesticides are poisonous to humans in lethal amounts, as well as to the pests that they control. This is true of the older insecticides, such as nicotine and the arsenicals, that have been in common use for many years, as well as for the newer chemicals such as DDT. All of them must be manufactured, formulated, and applied by the farmer for the control of different pests. In the manufacture of these chemicals, care is taken by industry to avoid accidents and poisoning of the workers. When the poison pesticides are distributed for use by the growers, very definite instructions are given governing their use. Red labels are put on the poisonous compounds indicating that the contents are deadly poison and directions emphasize that extreme care must be taken in the application of the pesticides to the various crops. In addition the grower is warned by salesmen of the various distributing organizations and also by State and Federal specialists to use respirators for the deadly poisonous materials and to avoid breathing the spray mist or dust during application. Every effort is made today to warn against possible exposure and accident. These precautions have been emphasized ever since poison sprays have been recommended for the control of crop pests. If these pesticides are to be manufactured and used for the purpose as intended, no additional laws can make them more safe for those who must use these products.

Pesticides may be applied in such a way that excessive residues may be and are avoided. Recommendations emphasize proper timing of the spray applications in order to obtain effective control of the pest. Timing of the spray, also, is specified to avoid treatments too near harvest that may leave residues on the crops that could not be removed by the food-processing methods. Chemical analyses of deposits before and after spray applications and at harvest show that this time period before harvest permits complete decomposition of some pesticides—such as parathion, our most deadly poison spray—and leaves no residue. All other pesticides weather or partially decompose so that a minimum of residue remains at harvest. Furthermore, recent advances in machinery used for the application of pesticides make for an even deposit of the correct and minimum amount of the chemical to give effective control of the pest. The turbine type speed sprayers and dusters, the airplane, and the large ground dusters—all can be regulated to deliver within a pound per acre of the desired amount. Excessive and unnecessary residues are thus avoided.

Since pesticides must be used in the production of food crops and since, also, many of them are poisonous to humans, none of them must be present as spray residues on food products in amounts that may result in a health hazard. It is this phase of the problem over which the public is greatly concerned. The real issue, however, has become very much confused both to the layman and the medical profession. Many believe that all farm products are covered with spray and must be thoroughly washed before eating. The publicity given DDT during the past few years and supplemented by many news items announcing discoveries of other new poisonous pesticides, have made the public aware of the widespread use of spray chemicals on food crops. Naturally they conclude that these poisons remain on fruits and vegetables as spray residues without knowing how small a percentage of the foods they eat really carry these residues and the trace amounts that may be present. Many articles and news stories have told of the wondrous properties of these new pesticides and their effectiveness for killing household insect pests and those that infest our growing crops. Too many writers, however, have distorted the facts and declared that these poisonous residues were being left on food crops in amounts that are a definite hazard to health. This is not true. Very few of the articles have reported chemical analyses for residues on fruits and vegetables that indicate the small amount present, if any, on the fresh product after washing in the packing houses or in the frozen and canned foods. It is this cleaned or processed food that is eaten by the public.

Again, many cases of food poisoning by microorganisms are reported annually throughout the United States. Too often many of these have been misattributed to poison spray residues. To my knowledge, spray residues on foods have never

caused acute poisoning. There simply never is enough pesticide present on a service of food to cause even a temporary illness. The real possible hazard to human health from eating food that may carry traces of poisonous spray residues is not, therefore, one of acute toxicity because of the deadly poisonous character of the spray chemical. The danger to health, instead, is from chronic complications, that is, physical complications that may result from eating food continuously over a period of time that contains sufficient of the poison spray to be injurious to health. The maximum amount of each pesticide, therefore, that may be present on a food product without causing a health hazard must be ascertained by toxicological studies. The amount of residues on various food crops as they are eaten by the public will serve to indicate whether there may be sufficient present to approach a health hazard.

Many chemical analyses have been made for the amounts of pesticide residues on food crops and have been reported in scientific journals and in State and Federal publications. Most of these analyses reveal residues present immediate after spray or dust treatments and show amounts remaining on the fruit or vegetable at harvest. These analyses, however, do not represent residues on food crops in the form that the fruit or vegetable is eaten by the public. Practically all food crops are processed at the packing house before sale. Produce for the fresh market is thoroughly washed and for such crops as cabbage and lettuce the outer leaves are removed. Every effort is made to prepare an attractive product that will sell rapidly. All frozen or canned products are given a blanching treatment and are washed thoroughly during the process. These treatments reduce spray residues to a minimum. During the past two seasons, we have endeavored to obtain samples for analysis of various food crops that had received applications of pesticides during the growing season and that had been prepared for the market as described above. The results of some of these analyses are given in table 1. The amounts of residue found show the extremely small trace of several pesticides present on fruits or vegetables after preparation for the retail trade. It is apparent to the toxicologists that no health hazard could possibly result from eating the food having such low amounts of spray residue.

Chronic health complications that may develop from eating food that contains traces of harmful spray residues also depends upon the extent to which daily or recurrent ingestion of the contaminated food continues. Not all foods included in the daily diet carry spray residues. Based upon statistics obtained from several sources, the approximate percentages of various foods eaten per person in the United States are given in table 2. From this data it will be noted that about 75 percent of the foods we eat contain no spray residues whatever. The other 25 percent may or may not have been sprayed during its production. Furthermore, some crops may have been treated with one pesticide while another may have received applications of an entirely different spray. Also, a large portion of some crops such as apples, pears, peaches, tomatoes, and the various citrous fruits are peeled before canning or freezing. Consequently no spray residues are present in these food products. Again, a large portion of the citrous fruits are ingested as juice and the consumer is not exposed to residues that may be present on the peel. It is probable, therefore, that not much over 1.0 percent of the food we eat is contaminated with a trace of any one pesticide. If only about 1.0 percent of the food we eat carries traces of spray residue, daily or recurrent ingestion of such food would be improbable and therefore chronic health complications would not develop. Also, the average service of a single food item at mealtime is usually less than one-fourth pound. Even though 10 times as much residue, as reported in the table, were present on a service of food, yet the actual amount per service would be so small that it would not seem that intermittent ingestion of such amounts would result in a health hazard.

SUMMARY

If spray residues are present on food crops throughout the country in amounts found in Oregon no further costly legislation is necessary to protect the public health. Residues found on food products, in the form that these foods are now eaten by the public, are far below amounts that could possibly cause a health hazard. Actual analyses of the food products obtained from the retail market will confirm this opinion. Analyses from other sources should not be considered.

TABLE 1.—*Spray residues on some food crops in the condition that they are ordinarily eaten*

Apples:	
Hood River fruit district:	
2 DDT sprays 90 percent	3.0 p. p. m. or less DDT.
2 DDT sprays 40 percent	1.0 p. p. m. or less DDT.
Pears:	
Medford fruit district:	
2 DDT sprays 85 percent	3.0 p. p. m. or less DDT.
2 DDT sprays 50 percent	1.0 p. p. m. or less DDT.
Apples and pears: parathion sprays as recommended.	0.02 to 0.1 p. p. m. parathion.
Cherries: Methoxychlor, 3 sprays, washed and canned or dusts.	0.1 to 1.1 p. p. m. methoxychlor.
Prunes: Methoxychlor, 50 percent, fresh, harvest, wettable, 2 pounds per 100 gallons.	0.34 p. p. m. DMDT.
Beans, string:	
DDT 5 percent dust by ground duster and airplane, fresh, frozen, canned.	0 to 0.5 p. p. m. DDT.
Parathion 1.0 dust by ground duster, fresh, frozen, canned.	Negative parathion.
Methoxychlor, 5 percent dust by ground and airplane, fresh, frozen, canned.	0 to 0.3 p. p. m. methoxychlor.
Corn: DDT 5 percent dust, fresh	Negative DDT.
Peas: DDT 3 and 5 percent dust, frozen	Do.
Head lettuce:	
DDT 5 percent, dusted at 4-inch size, fresh, harvest.	0.07 p. p. m. DDT.
Methoxychlor, 5 percent, dusted at 4-inch size, fresh, harvest.	0.05 p. p. m. methoxychlor.
Spinach:	
Parathion 0.5 and 1.0 percent, dust, week before harvest:	
Frozen	0.05 to 0.46 p. p. m. parathion.
Fresh, harvest	0.05 to 0.93 p. p. m. parathion.
Celery: Parathion, 0.5 pound, 25 percent to 100-gallon spray, fresh, harvest.	0.12 to 0.4 p. p. m. parathion.
Tomatoes: DDT, 3 percent, dust, fresh harvest	Negative DDT.

TABLE 2.—*Approximate percentages of various foods eaten per person in the United States*

	Percent		*Percent*
Flour, cereal, bread, etc	19.5	Beans	2.5
Meats, fish, poultry	11.9	Tomatoes	5.8
Fats, butter, margarine, etc	5.6	Cabbage	2.4
Sugars, candy, jellies, etc	5.7	Asparagus	.3
Potatoes	20.5	Peppers	.2
Potatoes, sweet	2.7	Cauliflower and brocoli	.3
Peas	1.4	Spinach, lettuce, etc	.3
Corn	3.9	Apples	2.9
Carrots	.9	Pears	1.1
Beets	.3	Oranges	4.9
Pumpkin	.3	Grapefruit	2.5
Onions	1.8	Other fruits	1.7
Cucumbers	.6		
Food not contaminated with spray	75.1	Food usually treated with a pesticide	24.9

Dr. HEDRICK. Who is the next witness?

Mr. KLEINFELD. Mr. Ryan.

(The oath was administered by the chairman.)

TESTIMONY OF HAROLD J. RYAN, AGRICULTURAL COMMISSIONER, COUNTY OF LOS ANGELES, CALIF.

Mr. KLEINFELD. Mr. Ryan, you are agricultural commissioner of the county of Los Angeles?

Mr. RYAN. That is correct.

Mr. KLEINFELD. Generally speaking, what are your duties?

Mr. RYAN. Supervision of the enforcement in Los Angeles County of the State laws relating to plant-pest quarantine, plant-pest control, fruit and vegetable standardization, and related duties.

Mr. KLEINFELD. How long have you been engaged in such duties?

Mr. RYAN. Since 1918 in my present position.

Mr. KLEINFELD. Will you please read your statement?

Mr. RYAN. It is my purpose to describe for the information of the committee the structure and operation of the local enforcement machinery in California which regulates the use of pesticide materials applied to control pests of agricultural crops. I will also state some opinions.

Los Angeles County experience is necessarily used here as the example but illustrates the functioning of local enforcement machinery available in other counties of the State.

As long ago as 1909, a number of California county boards of supervisors enacted ordinances regulating the business of fumigating and spraying. These ordinances all followed the same pattern. Anyone desiring to engage for hire in the business of pest control had to procure a license from the board of supervisors. This license was granted only after the applicant had satisfied the county agricultural commissioner of his competence, his knowledge of the proper conduct of the business, and that he had adequate equipment. His license was subject to revocation if he did work in a negligent or unskillful manner, or used improper materials or unfit or improperly constructed apparatus. The county agricultural commissioner was authorized to issue rules and regulations governing the conduct of the business.

In 1917 the California State Legislature enacted statutes requiring anyone engaging in the pest-control business to first secure a certificate of qualification from the county agricultural commissioner. This law also authorized the county agricultural commissioner to issue rules and regulations for the qualification of applicants and to revoke certificates.

Initially designated to insure effective pest control, this foundation served as a base for additional legislation and regulation intended to prevent injury to persons and property.

Since January 1, 1950, the agricultural pest control business throughout the State has been governed by the provisions of division 2, chapter IA of the California Agricultural Code in which the director of the State department of agriculture and the county agricultural commissioner are designated as enforcing officers.

This law requires any person engaging in the pest-control business to be qualified, have adequate equipment, get an animal State license and register with the county. A registered licensee to retain his license must refrain from misrepresentation, do his work properly, make reports and observe rules which may be issued by the State director and by the county agricultural commissioner.

Dr. HEDRICK. Do you mind telling us the price of those licenses?

Mr. RYAN. Fifteen dollars.

Dr. HEDRICK. Thank you, sir.

Mr. RYAN. And in Los Angeles County there is an additional registration fee of $20.

The director of agriculture is also chief enforcing officer of articles of the code contained in division 5, chapter 7, and governing spray residue (article 1), economic poisons, (article 3), and use and application of injurious materials (article 4). The county agricultural commissioner is designated in each of these articles to perform certain functions, such as supervising the reconditioning of produce seized for spray residue contamination and such as issuing permits for application of materials designated by the director as injurious materials. The county agricultural commissioner is also the local enforcing officer of State plant-pest quarantine and plant-pest control laws and is therefore actively interested in all matters pertaining to pesticides.

There are in Los Angeles County 63,000 acres of tree and vine crops of which 46,000 are in citrus. Crops worth $95,000,000 were the harvest from approximately 259,000 crop acres in 1950, that is for all plant crops, including tree and vine crops. Most if not all of these crops would be destroyed or so seriously damaged as to be unmarketable if their pests were not controlled by the application of chemicals. Citrus growers last year applied 56,000 acre treatments for pests, chiefly red scale, at a cost of $1,800,000. Many citrus orchards must be treated twice a year at an average cost of $34 per acre treatment. Deciduous fruit growers spent $96,000 for pest control. Vegetable and field crop farmers spent $632,000. Dairy farmers paid $23,400 for fly control. The total pest-control bill for these farmers was more than $2,500,000.

The great shift to use of the new pesticide materials (chlorinated hydrocarbons, parathion, and TEPP) has occurred since 1943. During the year ending with June 1944, some of these materials were applied to about 170 acres out of some 300,000 crop acres. The proportion treated since then with the new materials in terms of approximate percent of total acreage treated each year starting with 1944–45, was 5, 15, 30, 45, 55, 60, and last year 65 percent of more than 180,000 acre treatments for posts.

Most of the pest-control work is done by commercial pest-control operators. These are licensed by the State after they are found qualified and are registered by the county after their equipment is found suitable.

Applicants who do not have a prior record of satisfactory operation are examined by the State, usually assisted by the local deputy county agricultural commissioner, to find if they have sufficient knowledge of the pests and crops they intend to do work on and the materials they intend to use. The license when issued is restricted to define the field or fields of operation within which they are qualified.

County enforcement of the plant pest control and pesticide laws is one of the duties of a deputy county agricultural commissioner with 2 assistants and 14 senior county agricultural inspectors, each residing in a district within which he performs his duties. These 17 enforcement officers are civil-service employees qualified by competitive entrance and promotional examinations. Most of them are

college graduates who majored in one of the agricultural sciences. Their average length of county service is 20 years. The deputy in charge maintains close contact with two State department of agriculture officers who cover the several southern California counties. These are a field supervisor of agricultural pest control and a district inspector of the bureau of chemistry.

In the calendar year 1950 there were 147 licensed and registered concerns in this county employing approximately 300 crews. We assisted the State in the examination of 28 applicants of whom 4 failed to qualify and were denied licenses. Of the total licensees, 55 were classified as "home-property sprayers" and operated only on city lot properties. Usually each employed only one crew. The remaining 92 orchard and field operators employed approximately 250 crews.

It is our duty to enforce regulations issued by the director and the commissioner and designed to prevent improper or ineffective application of pesticides. Pest-control licensees must make a monthly report of work done on forms furnished them. The regulations of the director prohibit the use of pesticides or dosages not recommended by competent agencies.

Approximately 7,500 jobs were reported by commercial operators in 1950. We made 750 inspections of crew operations, so visited about 1 out of every 10 jobs. There were 150 reports of faulty crew operation but none for operations involving unsafe use of the pesticides designated by the director as injurious materials. In addition to these inspections, probably 10,000 or more inspections of farm properties are made each year by county agricultural inspectors to determine the need for pest treatment or the results of treatments applied. When these inspections are made, inspectors are alert to notice and report evidence of the application of materials in amounts that might leave residues harmful to man or bees or livestock, or drift in harmful quantities to other properties.

With the State department of agriculture and the University of California, we make every effort to keep our farmers and pest-control operators fully advised of all precautions that need be taken to make the use of pesticides safe as well as effective Information issued for this purpose by insecticide manufacturers has also kept users well informed.

There is is a mutual confidence here among growers, regulating officials, experiment-station workers, and pest-control operators. This and their common appreciation of the necessity of protecting the consumer against avoidable hazards has brought about a great degree of willing compliance with the safety restrictions on the use of pesticides. Growers look to the county agricultural inspectors for the latest information on pesticide uses. A great deal of the up-to-date information is given to pest-control operators and growers by inspectors doing their daily work.

An example of one of the methods used to furnish the latest information on recommended or nonrecommended materials is demontrated by three letters written to pest-control operators doing farm-fly control and attached hereto as exhibits I, II, and III. The first letter transmitted a progress report on insecticide tests made by the University of California and recommended the use of BHC, methoxychlor, chlordane, and toxaphene in that order but pointed out that

methoxychlor was apparently the safest as far as residue was concerned. That letter was dated April 6, 1949.

The second letter withdrew the recommendations because of "recent announcements" by Federal and State agencies concerning the hazards of use of certain chlorinated hydrocarbon materials. That letter was dated May 18, 1949.

The third letter announced that lindane was acceptable for fly control in dairy barns but was not approved for spraying dairy cattle or forage or animals being furnished for slaughter, also that methoxychlor could be used under the same limitations and that BHC had the additional limitation of nonuse in milking barns but could be used elsewhere on farm properties. That letter was dated August 10, 1949.

We report any instances of apparent improper use of poisonous materials to the State department of agriculture for investigation by the Bureau of Chemistry. The State department of agriculture promply investigates all such reports.

In the years prior to the development of the new materials the arsenicals were widely used. There were many reports of excessive use of these poisons. Some of these reports were confirmed by State investigation and it seems that in contrast to the situation today, we were continually concerned with some seizure or pending seizure of residue-contaminated products by California enforcement officers.

For the several years past there have been almost no reports of misuse or suspected misuse of pesticides in spite of the continued alertness of inspectors and the greatly increased use of the new materials.

I think I would be inclined to say at this point there is greater alertness of inspectors because of greater suspicion of new materials being very widespread. No report or suspicion came to our knowledge in 1950 or 1951 of any injury to persons or property from the use of any produce treated with injurious materials except in one instance. This involved the death of two riding horses at a stable treated with a mixture of BHC and lindane. A hearing held by the State disclosed the information that the horses had been fed some stale hay which may have caused their death.

The State director has named parathion, EPN, TEPP under certain circumstances, and the common arsenicals when dusted by machine, as injurious materials requiring permits for their application.

The only permits issued have been for parathion. Of the 75 permits issued to September 1 in 1951, 30 were for use in nurseries where no food products are involved, 16 in citrus groves for use of 2-percent strength only, and 29 for use on vegetable and field crops. A chemical company pamphlet describing the precautions to be observed in use of parathion has been furnished each permittee.

The regulatory officials in California have been slow to permit use of new materials. Because of the severe damage caused by agricultural pests in California, this has long been a ripe experimental field for new materials and we have become wary of premature commercial use of untried remedies.

We have held back on the use of parathion, awaiting the careful recommendations of the university citrus experiment station. The complete recommendations of the university concerning use of parathion on citrus are covered in a 15-page circular. Their current rec-

ommendations do not advise its use on citrus at more than 2½ pounds per 100 gallons of spray. Use of a greater dosage is therefore a violation of regulations. As pointed out before, the director's regulations do not permit use of dosages that are not officially recommended. Most of the parathion used on citrus is at the rate of 1.6 pounds per 100 gallons, which will result in the application of 6 to 8 pounds per acre, depending on the size of trees.

The dust form mainly used on vegetables and field crops is limited to 2-percent strength or less. Most applications are actually made at 1-percent strength. Recommendations until recently were against the use of parathion within 30 days from harvest on any crop used for human consumption. At present the limit is 15 days.

Many precautionary notices are issued to avoid known or suspected hazards of the new materials.

Hay growers have been advised not to use DDT or other chlorinated hydrocarbon insecticides within 30 days of cutting the crop. We recommend that no chlorinated insecticides be used on crops such as cabbage and cauliflower after the heads have formed.

Many other examples can be given of the specific information and notices of restrictions continually passed on to the farmers and pest-control operators. Food is essential. Pest control is essential to food production. Some hazard will always exist until we have an effective pesticide which is entirely nontoxic to warm-blooded animals. And I know of no one who knows of such an insecticide at the present time. Our common problem is to reduce the hazard to a feasible minimum while increasing the effectiveness and reducing the cost of the pesticide. I mean the common problem of the Federal, State, local governments, the industry, and the operators.

Considerable commercial and government experimental work is being done to find more effective and inexpensive pest-control materials. There is, we believe, in this State a thorough awareness on the part of farmers, pest-control operators and officials of the damage to our market that could be caused by any public report or rumor of injury to human health by any crop pesticide. Our people are very conscious of the value of maintaining the good reputation of California fruits and vegetables.

We also believe that local regulation and enforcement is usually more effective and gets quicker justice than remote-control. Washington, D. C., often seems very remote. We think the Federal Government should refrain from regulation wherever local control is effective. When the Federal Government must act to fulfill its obligation to police products shipped in interstate commerce, we need prompt and specific statements of residue tolerances or prohibitions.

We believe the most effective control of the quality of fresh farm products can be had through authority vested in an agricultural enforcement agency. There need be no fear that such an agency will favor the farmer at the expense or hazard of the consumer because the agricultural industry is fully aware that the consumer will protect himself with disastrous effects on the producer if he has even a suspicion that the produce is not safe to buy.

We believe that such Federal regulation as may be necessary in this field should be vested in the Department of Agriculture.

(The three letters submitted as exhibits by Mr. Ryan are as follows:)

EXHIBIT I

COUNTY OF LOS ANGELES,
Los Angeles, Calif., April 6, 1949.

TO PEST CONTROL OPERATORS DOING FARM FLY CONTROL IN LOS ANGELES COUNTY:

Enclosed is a progress report by Dr. Robert L. Metcalf and Dr. Ralph B. March of the University of California Experiment Station at Riverside, on results of their tests for farm-fly control. The report gives additional information to the one you received last fall, particularly on fly resistance to DDT and other materials.

Compare the control results of the materials tested and note the dosages used. From the standpoint of both results and cost this office recommends benzene hexachloride (BHC) as the preferred material, followed by methoxychlor (marlate), chlordane and chlorinated camphene (toxaphene), in that order, and at dosages specified.

Flies have shown considerable resistance to marlate, particularly where DDT has been previously used, which includes most of the dairies. However, it is apparently the safest material to use as to poisonous residue, of those materials that will give effective results. Where flies are not resistant it should do the job.

Although there has been no trouble reported of benzene hexachloride spray imparting a flavor or odor to the milk, the least pure grade or 6 percent gamma-isomer is definitely not recommended. It is also best to use only the 25 percent gamma-isomer inside the milking barns and the 10 or 12 percent gamma-isomer for outside spraying.

Do not use DDT on animals for fly or other insect control. It has been found to be accumulative in the animals, and has repeatedly been recovered in the milk of dairy cows. Traces of DDT have also been recovered in the milk from just applying it in the barn.

In dairies spray thoroughly outside the milking barn as well as inside. Treat corrals, manure piles, other buildings, etc. Never get any of the chlorinated materials on feed and wash out feed or watering troughs after spraying. Do not treat milk-bottling rooms, or where milk is stored.

HOWARD WILCOMB,
Deputy Agricultural Commissioner.

EXHIBIT II

COUNTY OF LOS ANGELES,
Los Angeles, Calif., May 18, 1949.

TO PEST CONTROL OPERATORS DOING FARM FLY CONTROL IN LOS ANGELES COUNTY:

This is to notify you that the recommendations in my letter to you of April 6, 1949, are rescinded because of recent announcements of Federal and State agencies concerning the hazards of use of certain of the chlorinated hydrocarbon insecticides in dairies.

As soon as we have any new information on the subject I will advise you.

Very truly yours,

HOWARD WILCOMB,
Deputy Agricultural Commissioner.

EXHIBIT III

COUNTY OF LOS ANGELES,
Los Angeles, Calif., August 10, 1949.

TO PEST CONTROL OPERATORS DOING FARM FLY-CONTROL WORK IN LOS ANGELES COUNTY:

The Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, has recently selected the name "lindane" for the pure gamma isomer of benzene hexachloride in order to distinguish the derivative from technical benzene hexachloride. These will therefore be considered as two separate materials in the future.

The bureau of chemistry, California State Department of Agriculture, has announced that lindane is being accepted for registration and container labeling

for use in dairy milking barns for fly control. However, its use is not approved for spraying dairy cattle or forage, or animals being finished for slaughter.

The bureau of chemistry is not accepting the registration of benzene hexachloride (BHC) for use in dairy milking barns, nor on animals or forage as above. This material (10- and 12-percent powder) can continue to be used on other farm premises.

Methoxychlor is the only other chlorinated hydrocarbon insecticide that is registered for use in the same manner as lindane.

HOWARD WILCOMB,
Deputy Agricultural Commissioner.

Dr. HEDRICK. Can parathion and DDT be used in the same solution, the same pesticide?

Mr. RYAN. I think you have witnesses coming up soon who can answer technical questions much better than I.

Dr. HEDRICK. You seem perfectly capable to answer most of them to me.

Mr. RYAN. You have got some good ones coming up in a few minutes.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. Yes.

In the absence of my colleague who was with us on most of this trip, I know if he were here he would want to propound this one.

On the last page of your statement, you say you are aware of the damage to your market that could be caused by any public report or rumor of injury to human health by any crop pesticide.

Mr. Horan, who is a member of this committee, has frequently asked about a report that was put out by one of your movie stars here in California advising people of the great danger involved in pesticides that were used on fruit crops, and advising people not to eat any fruit that had been sprayed.

Now are you aware of that statement which was given wide publicity throughout the press in the East, at least?

Mr. RYAN. No; I don't recall hearing of it.

Mr. JONES. That statement did appear in the newspapers in the East and was attributed to this movie star. Mr. Horan has asked at each of these hearings if anything had been done by any State agency here to try to counteract the effect of that report which he felt had done a great injury to the fruit-producing sections, and which he felt should have been answered by some official authorities who were acquainted with the situation. You say you have not heard of that report?

Mr. RYAN. I have not heard of that report.

Mr. JONES. I have just one more question. On page 3 you say:

The regulations of the Director prohibit the use of pesticides or dosages not recommended by competent agencies.

How many agencies are involved and would you care to name the agencies that you would classify as competent agencies?

Mr. RYAN. Yes; I will attempt to do so. The State department of agriculture, the Federal Bureau of Entomology and Plant Quarantine, the University of California, the Agricultural Extension Service, the county agricultural commissioner. I mention those most competent.

Mr. JONES. Those are the ones your department relies on most for recommendations which are generally followed by your department?

Mr. RYAN. Entirely. Our department relies entirely upon the recommendations of the Federal agency and the two State agencies—the

university and the State department of agriculture. Primarily the Federal Department of Agriculture and the university have research institutions that determine for us which things are right to use and which are not.

Mr. JONES. I take it from that statement your department does not have the facilities for conducting these tests and you do rely on these other competent agencies?

Mr. RYAN. That is right; we do no research.

Mr. JONES. I have no other questions.

Dr. HEDRICK. Mr. McDonough, do you have any questions?

Mr. MCDONOUGH. I have known Mr. Ryan for many years in county service and as a policing agency on this very important function he has done a remarkably fine job. I have no questions. He has had the job of policing pest-control applications and licenses to one of the largest counties in the United States, producing probably the most diversified crops of any county in the United States. And I think our agricultural wealth by county is the greatest of any county in the United States. That is a personal observation for the benefit of the record so that other people in the United States might know what Los Angeles County is doing.

Dr. HEDRICK. Any other questions?

Mr. MCDONOUGH. No.

Mr. KLEINFELD. No questions.

Dr. HEDRICK. Thank you very much, Dr. Ryan. You have made a very valuable statement.

Mr. RYAN. Thank you.

Dr. HEDRICK. Who is your next witness?

Mr. KLEINFELD. Dr. Metcalf.

(The oath was administered by the chairman.)

Mr. KLEINFELD. Dr. Metcalf, will you please read your statement including your biographical material?

TESTIMONY OF ROBERT L. METCALF, PH. D., CHAIRMAN, DIVISION OF ENTOMOLOGY, UNIVERSITY OF CALIFORNIA CITRUS EXPERIMENT STATION, RIVERSIDE, CALIF.

Dr. METCALF. My name is Robert L. Metcalf. I am associate entomologist and chairman of the division of entomology of the University of California Citrus Experiment Station. I graduated from the University of Illinois in 1939 with a bachelor of arts degree with a major in entomology and a minor in chemistry and subsequently obtained a master of arts degree with a major in entomology and a minor in chemistry from this institution in 1940. I received a doctor of philosophy degree from Cornell University in 1943 with a major in entomology and a minor in biochemistry. From 1943 through 1946 I was occupied in research work in the development of DDT and other new insecticides as public health measures and for use by the Armed Forces, being employed as an entomologist for the malaria control staff of the Tennessee Valley Authority, as a consultant to the Bureau of Medicine and Surgery, United States Navy, and in work with the Office of Scientific Research and Development. Since 1946 I have been employed at the citrus experiment station of the University of California in the development of new insecticides for use on citrus

and other California crops. I have published about 50 papers in scientific journals dealing with insects and their control and I am a coauthor of several books dealing with insect control. I am a member of the American Association of Economic Entomologists, the Entomological Society of America, the American Chemical Society and the Society of Sigma Xi.

Dr. HEDRICK. Do you mind giving the names of the books?

Dr. METCALF. Destructive and Useful Insects is one. Mode of Action of Organic Insecticides.

I was a coauthor of a book on malaria control on impounded waters, printed by the United States Government Printing Office.

Dr. HEDRICK. That is fine. Now you can go ahead and read your statement.

Dr. METCALF. Because the work of the division of entomology of the University of California is so intimately connected with the development of new agricultural insecticides for use on citrus and other crops in southern California, I should like to outline the procedures to which a new insecticidal chemical is subjected to our institution before we feel that its use is satisfactory on agricultural crops in California. Factual information which is provided by the experiment station, along with that supplied by other impartial organizations and agencies, is then used as a basis for determining the suitability of new pesticides for prospective licensing by the State bureau of chemistry.

The staff of the division of entomology of the University of California at Riverside consists of 46 persons of whom 42 have college degrees and 16 have doctor of philosophy degrees. Included in this staff are four graduate chemists. Many of our scientific personnel are nationally known in their respective fields of specialization.

The peculiar nature of citrus crops with regard to their permanence, the large number of destructive pests attacking them, the complicated ecological factors involved in chemical and biological control of certain citrus pests, the wide use of not only fresh and canned fruits and juices but also such byproducts as dried peels for cattle feed and purified orange and lemon oils, and above all the high standards of quality demanded by the consumer-public; make it essential to investigate all the effects of the use of a potential new insecticide with the utmost thoroughness over a period of several years. As an illustration of the thoroughness with which such work must be done, I shall briefly discuss the development of several representative insecticides now widely used in citrus pest control.

The initial work on a promising insecticidal chemical consists in the laboratory evaluation of its activity to a representative group of insect pests. Such screening tests consist in the determination of the dosage versus mortality values for the various insects in a series of standardized screening tests. This phase of the work usually extends over several months and upon its completion, information is at hand regarding its relative effectiveness of the chemical to a variety of insect pests, and its degree of acute toxicity to the citrus plant. Most of the compounds investigated do not meet the exacting standards required for further work as attested by the fact that of the more than 3,700 organic compounds studied during the past 5 years, only about 200 have proven sufficiently promising for further investigation.

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Dinitro-o-cyclohexylphenol or DNOCHP was first studied for the control of mites attacking citrus in 1935 (Boyce et al. 1939a). This compound showed a high degree of effectiveness as an acaricide and detailed entomological and chemical studies were carried out during the next 3 years to prove its safety and effectiveness (Boyce et al. 1939b). These included chemical and phytotoxic studies of various spray and dust formulations; the development of an analytical method for residue determinations; the carrying out of more than 500 chemical determinations on residues remaining on citrus and other crops at harvesttime; the development of special equipment for the application of this material; and the sponsoring of pharmacological studies of the public health aspects of this material by the University Medical School (Hrenoff and Leake, 1939). It was not until the completion of the various phases of this work, or more than 3 years after the investigations were begun, that the use of DNOCHP as an acaricide was suggested as satisfactory so that licensing was permitted by the State of California Bureau of Chemistry.

DDT was first investigated at the citrus experiment station in 1944 where it showed unusual promise against California red scale, purple scale, citricola scale, and citrus thrips. Therefore, the next 4 years were occupied in intensive studies of this material from entomological, chemical, and public health standpoints. In the course of these studies many tons of DDT sprays and dusts were applied to about 3,600 acres of test plots, involving citrus alone, in 9 southern California counties. In order to develop adequate information on the nature of residues on the surface, in the peel, in the juice, and in byproduct oils of citrus, it was necessary for one of our chemists, Dr. F. A. Gunther, to develop an original analytical method for DDT (Gunther, 1946). Using this method, more than 15,400 individual chemical determinations of DDT residues resulting from various formulations and methods of applications have been made in our laboratories on various crops. (Gunther and Miller, 1950; Gunther, Barnes, and Carman, 1950; Carman et al., 1950; Barnes et al., 1950). Despite this wealth of information, the use of DDT has had deleterious effects on certain predaceous insects, resulting in abnormal increases of red mites and cottony cushion scale on citrus. Therefore, its use on citrus has not been encouraged with the exception of carefully timed applications for the control of citrus thrips, citricola scale, and black scale.

Parathion became available to us as a small laboratory sample early in 1947. Tests quickly showed that this chemical was unusually effective against armored and unarmored scales of citrus. Therefore, experimental use with this material was expanded during the next 3 years, during which time more than 24,000 pounds of parathion wettable powder was applied by our scientists on test plots aggregating more than 1,500 acres of citrus alone. It was not until July 1950, however, that we felt we had sufficient information regarding the effectiveness and methods for the sale usage of this material to suggest its use and registration by the Bureau of Chemistry of the California State Department of Agriculture. During these 3 years of intensive study, more than 6,100 separate chemical determinations have been made of parathion residues on citrus fruit surfaces, in peel, in juice, in byproduct oils, and from various formulations, methods of application, and methods of fruit processing (Gunther and Blinn, 1950;

Gunther, Barnes, and Carman, 1950; Carman et al., 1950; Barnes et al., 1950). In the course of these 3 years of intensive experimentation, studies have been made in cooperation with the State of California, bureau of adult health of the effect of continuous and intermittent usage of parathion on human health and of the extent of atmospheric contamination by toxic parathion vapors, dusts, and sprays during the handling of this material in spray operations. The experiment station has also cooperated with the California Fruit Growers Exchange and the University of Southern California School of Medicine in studying the effects of feeding to laboratory animals various citrus products treated with parathion.

The final chemical which I wish to discuss is Beta-chlor-ethyl-beta' (p-tertiarybutyl phenoxy) alpha'-methyl ethyl sulfite or Aramite. This compound was initially tested by us in February 1948. It showed unusual promise in the control of mites, particularly on citrus, and was unusually attractive because of its very low mammalian toxicity (the oral LD–50 to laboratory animals is about 6 grams per kg. of body weight). During 1949 and 1950, its use under a variety of conditions was intensively studied and more than 9,000 pounds of wettable powders and 2,200 pounds of dusts were applied on experimental plots. Despite the low degree of mammalian toxicity of this compound, the residue problem was thoroughly evaluated. To do this, it was necessary for Dr. Gunther and others of our chemists to develop an entirely new analytical method for this material (Gunther et al. 1951). Therefore, it was not until January 1951 that sufficient information was at hand to suggest the licensing of this material for use on citrus.

The above discussion of the experimental histories of four insecticides at the University of California Citrus Experiment Station has been presented to show that the development of the uses of these new insecticidal chemicals is not a rapid and haphazard business, but results from a slow-moving and painstaking scrutiny by a highly trained research team of entomologists and chemists working in cooperation with pharmacologists and toxicologists. No new insecticidal material has been licensed for use on citrus in California without at least three seasons of investigational work involving the application of several tons of insecticide on plots numbering in the thousands of acres. The information obtained is supported by hundreds and usually thousands of chemical determinations of insecticide residues on and in produce and byproducts at harvest. The final decision as to the ultimate safety and efficiency of the new insecticide to the grower and consumer is made only after close consultation, with the Bureau of Chemistry of the California State Department of Agriculture, with the United States Department of Agriculture, with the Food and Drug Administration, and with the California Fruit Growers Exchange, Mutual Orange Distributors, and other marketing organizations.

Therefore, it is our considered opinion that the present system of registration and licensing of agricultural chemicals, as practiced in California, is entirely adequate to secure maximum thoroughness of investigation and safety to the consumer, and yet is consistent with the expediency to be desired in the development of new pesticides for the protection of agricultural crops.

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Dr. HEDRICK. I am going to ask you the same question that I asked the gentleman before. Can parathion and DDT be used in the same mixture?

Dr. METCALF. Yes, sir, they can.

Dr. HEDRICK. Do they aid each other?

Dr. METCALF. In general, yes.

Dr. HEDRICK. Do they act similarly or differently?

Dr. METCALF. Parathion is a specific nerve poison affecting the cholinesterase. As I say, the action of DDT has not been thoroughly worked out. The effects on the nervous system differ from those of parathion.

Dr. HEDRICK. You think the conjunction of those two preparations does improve the effect?

Dr. METCALF. It is not possible to make a categorical statement. In some cases it may be used against pests where one of the compounds with ineffective, and in that case you would not derive any additional benefit of the mixture over the one of the two.

Dr. HEDRICK. It seems to me the pests are maybe gaining on us. What are we going to do about it? After being up at the laboratory yesterday I had about decided they were going to whip us if we do not find something else to use on them. What is your opinion?

Dr. METCALF. A great many people are busily engaged in that occupation at the moment. I think in general the advent of these new chemicals has made the public more pest conscious than before, which contributes in no small measure to the feeling the pests are gaining on us. We feel that we should control pests that people 10 years ago did not consider.

Dr. HEDRICK. One hears of new pests every few days, that were never heard of before.

Dr. METCALF. There are a great many factors involved in that picture. In some cases it is definitely shown the use of these new chemicals has achieved an almost complete reduction in one major pest, where a new pest has come up to take its place.

Dr. HEDRICK. Has come to the funeral, in other words. [Laughter.]

Dr. METCALF. That is more or less the picture. I think our southern California area is remarkable, with so much industry, with contributions of smog and other practices which have contributed to some pests becoming more important than they were before. All sorts of conditions like that are involved.

Dr. HEDRICK. You are not particularly worried over the situation then? You think we are going to handle it all right?

Dr. METCALF. I think we are going to be able to handle it.

Dr. HEDRICK. That is fine. I am glad to hear that.

Any questions, Mr. Jones?

Mr. JONES. I would be interested to know—this morning it was suggested that the effects of parathion and DDT were transmitted to the fruit through the root of the plant or through the plant. Have your tests borne that out?

Dr. METCALF. No, sir; they have not. We have no evidence at all to show that DDT or parathion is absorbed by the plant and transmitted. Some of the newer chemicals which have that property we are trying to find intelligent ways to make use of.

Mr. JONES. You have, in other words, been conducting tests to try to find out if that is true, and your findings have been to the contrary?

Dr. METCALF. That is correct.

Mr. JONES. I notice on the first page here you speak of dried peels for cattle feed. Do you find there is much DDT or parathion left in that feed?

Dr. METCALF. Quite often that has been a problem with these new materials. DDT and parathion are selectively absorbed in some cases by the oils and fats in citrus foods. In that case it becomes necessary to conduct careful experiments as to the possible toxicity of these materials.

Dr. Thienes, who, I believe, will testify, has a great deal of information on that subject. In some cases it has been suggested that fruits treated with materials such as parathion, the byproducts should not be fed to cattle because of possible danger.

Mr. JONES. That is what I was wondering—if you knew whether or not the university were recommending that that peel be fed in cattle feed.

Dr. METCALF. We are definitely suggesting it not be fed.

Mr. JONES. That it not be fed?

Dr. METCALF. I should add, that some of the benefits of using parathion have been to raise the solids in the citrus fruit. Since the new juice concentrates appeared on the market, the growers generally paid in terms of soluble solid content. So he can gain more by realizing on this increase in value of the juice and throwing away the peel, than by using the peel for byproduct uses.

Mr. JONES. I have one other question. Has it been your experience that any of the DDT or parathion or that type of pesticide penetrates the peel and gets into the pulp or the juice of the fruit?

Dr. METCALF. We have a great many now to show that no parathion is found in the pulp or the juice of the fruit. It is found in the peel, as I explained. The same picture is true of DDT essentially.

Mr. JONES. You think there is no danger if care is exercised in removing the spray residue before the fruit is handled of that chemical being present in the juice?

Mr. METCALF. That is correct. We have supported that by thousands of analyses.

Mr. JONES. I have no other questions.

Dr. HEDRICK. Mr. McDonough.

Mr. MCDONOUGH. Did you hear the testimony this morning about the possibility of DDT getting into the fiber of the vegetable or the fruit through the root structure in Florida?

Dr. METCALF. No, sir; I was not present at that time.

Mr. MCDONOUGH. There was testimony given that in Florida there was a case where DDT had gotten into the root structure and passed on up through the fiber, the plant and the fruit. Have you had any experience with that at all?

Dr. METCALF. That would be directly contrary to all our findings if that is the case.

Mr. MCDONOUGH. In connection with your thorough testing of new chemicals coming into California, do you have any problem with the agricultural chemical manufacturers in taking too long a time to determine whether their new chemicals are going to be used in California or not? Is there any pressure while investigating, that you are holding them up?

Dr. METCALF. I think in all cases we have found them extremely cooperative and entirely sympathetic with our investigations and we have never experienced the slightest pressure in attempting to introduce any material on the market.

Mr. MCDONOUGH. What has been your experience in insect resistance to DDT or parathion?

Dr. METCALF. We have a very large and expensive history here with the housefly which has become resistant to DDT and lindane. One of the major research projects at the moment is to find other means of dealing with it. Other than that we have not had the difficulty with parathion.

Mr. MCDONOUGH. How about the citrus fruit pests? Have they become resistant also?

Dr. METCALF. The scale insect pests have become resistant to hydrogen cyanide, and the citrus thrips have become resistant to tartar emetic. Those are the other two major cases of resistance.

Mr. MCDONOUGH. In other words, you don't find anything in the citrus fruit that is resistant to frequent applications of DDT and parathion?

Dr. METCALF. No, we haven't.

Mr. MCDONOUGH. Do you know of any other State in the Union that is as thorough in checking on agricultural chemicals as California?

Dr. METCALF. I don't believe there is one, in my opinion.

Mr. MCDONOUGH. That is fine. That is enough for the record, Mr. Chairman. [Laughter.]

Dr. HEDRICK. I believe the voters appreciate that.

Mr. JONES. I have one other question. Carrying the question a little further: Is there any possibility in your opinion that the accumulation of DDT in the soil could be transmitted to the plants? In other words, after spraying, the DDT would fall on the ground and the rains would carry it down. Could the DDT be transmitted to the plant, do you think?

Dr. METCALF. We do not think so, particularly a citrus, because very little DDT is used for one thing.

Mr. JONES. How about on other plants?

Dr. METCALF. On other plants, there is no information to indicate it could be.

Mr. JONES. Have there been any tests made on that line?

Dr. METCALF. The United States Department of Agriculture has been making at Beltsville, for many years since the advent of DDT, extensive tests along that line. I don't believe they have ever shown the DDT translocated through the plant to the edible portion.

Mr. JONES. That is all.

Dr. HEDRICK. Does the codling moth build up resistance against DDT?

Dr. METCALF. We have not been able to show it has as yet, at any rate.

Dr. HEDRICK. That is a possibility. If the fly can do it, there is no reason why the moth could not do it, is there?

Dr. METCALF. The fly has so many more generations, I would expect it to be long before the codling moth would.

Dr. HEDRICK. Mr. Kleinfeld.

Mr. KLEINFELD. Dr. Metcalf, on page 1 of your statement you have mentioned methods of chemical and biological control of certain citrus pests. Do you know of any official publications issued by any Federal bureaus going into methods of biological control?

Dr. METCALF. The Bureau has in its technical circulars and publications given summaries of biological matters for specific crops, specific pests. There isn't any Federal publication that covers that in general that I know of. There are a number of good and reputable textbooks that do so.

Mr. KLEINFELD. On page 3 of your statement you say:

> It was necessary for Dr. Gunther and others of our chemists to develop an entirely new analytical method for this material.

Are you discussing Aramite there?

Dr. METCALF. Yes.

Mr. KLEINFELD (reading):

> Therefore, it was not until January 1951 that sufficient information was at hand to suggest the licensing of this material for use on citrus.

Then apparently it is your view that an insecticide should not be released until you have available an analytical method for it?

Dr. METCALF. I would say that is definitely my view.

Mr. KLEINFELD. There has been testimony before the committee that there are several insecticides in use, perhaps in some restricted use, for which there are no methods of analysis available. Are you familiar with chlordane, for example?

Dr. METCALF. Yes, sir; I am.

Mr. KLEINFELD. How about that, as far as a quantitative method of analysis is concerned?

Dr. METCALF. There is at present no very satisfactory method. There is a great lack of investigation in chlordane.

Mr. KLEINFELD. How about toxaphene?

Dr. METCALF. Another one in the same category.

Mr. KLEINFELD. Would the problem be more difficult if DDT were used simultaneously with chlordane or toxaphene?

Dr. METCALF. Yes; it would. There is no adequate way to distinguish several of those materials when used in a mixture.

Mr. KLEINFELD. That is a real problem, is it not?
Dr. METCALF. That is a real problem.
Mr. KLEINFELD. I have no further questions.
Dr. HEDRICK. Thank you very much.
Dr. METCALF. Thank you.
Dr. HEDRICK. Who is the next witness?
Mr. KLEINFELD. Dr. Thienes.
(The oath was administered by the chairman.)

TESTIMONY OF CLINTON H. THIENES, M. D., PH. D., PROFESSOR, PHARMACOLOGY AND TOXICOLOGY, UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES, CALIF.

Mr. KLEINFELD. Dr. Thienes, you are professor of pharmacology and toxicoloy and head of the department of pharmacology and toxicology of the University of Southern California?

Dr. THIENES. That is right.

Mr. KLEINFELD. Will you give the committee a brief, biographical statement of your qualifications?

Dr. THIENES. I am a graduate of the University of Oregon, 1918, with honors in chemistry; 1923, the degree of doctor of medicine and the degree of master of science. And in 1926, doctor of philosophy degree from Stanford University. I was a medical fellow of the National Research Council when I was doing graduate work at Stanford.

On graduation from the University of Oregon School of Medicine I was appointed as an instructor in pharmacology, and held that position until 1929 with one or two advances in rank. Of course, during 1 year I was away at Stanford. Then in 1929 I became associate professor of pharmacology at the University of Southern California. In 1931, I became full professor and head of the department of pharmacology, which later became known as the department of pharmacology and toxicology. I am licensed to practice in the State of California, and I was licensed in Oregon. I haven't kept that registration alive, however. I am a member of the American Society for Pharmacology and Experimental Therapeutics.

Dr. HEDRICK. We accept your qualifications. I wonder if you would read your paper.

Dr. THIENES. All right, sir.

This statement is based on an experimental study carried on in cooperation with the University of California Citrus Experiment Station, Riverside, Calif., under the direction of Dr. A. M. Boyce; and with the By Products Research Laboratories, California Fruit Growers Exchange, Ontario, Calif., Mr. W. E. Baier, manager. The experiment began about September 1948 and was continued until March 1950.

At the University of California Citrus Experiment Station a group of orange trees were sprayed with a suspension of 4 pounds of 25 percent wettable parathion powder in 100 gallons of water. Two days later the oranges were harvested, and delivered to the By Products Research Laboratories, California Fruit Growers Exchange, where they were washed and the juice removed by the ordinary commercial process. The juice was canned and pasteurized and the peel dried in

the usual way. This juice and this dried peel was stored in a cold room until ready to feed to the test animals, albino rats. Similarly, juice and peel were prepared from unsprayed oranges for control.

In addition to the above stores of juice and peel, which were fed throughout the experimental period, there were peel and juice from trees sprayed on Saturday, harvested on Monday, and processed and finally delivered to the test feeding laboratories at the University of Southern California on Friday of each week for 48 weeks. Similarly, juice and peel from unsprayed trees were delivered once each week on Friday. From September to March the oranges were of the Valencia variety and from March to September they were navel oranges.

Equal numbers of male and of female rats, in groups of 12 to 20, were fed the powdered stock diet, of a formula commonly used for feeding the rat colony; for those rats to be fed on a diet containing the dried orange peel, the peel was powdered in an electrically driven mill, and mixed in the diet formula to the extent of one part of peel to three parts of stock diet. That is by weight. As judged by the growth curves of the rats, by the lack of unusual symptoms, by the comparative mortality—that is, comparing mortality on the test diets with those on the control diets—and by the cholinesterase activity of the blood, it was apparent that the amounts of parathion remaining on the dried peel were not sufficient to cause poisoning of the rats to which it was fed. Similarly, fresh peel was mixed with the powdered diet to the extent of 50 percent, without causing evidence of parathion poisoning.

Chemical analyses of the juice at no time revealed the slightest trace of parathion. Hence this insecticide does not penetrate through the peel to pass into the juice. Analysis of the dried peel revealed from four—and I must change the number that I sent in on the basis of further tests to 25 parts per million. Most of the weekly lots contained 10 parts per million or more of parathion in the dried peel.

On the basis of these studies it is apparent that there is no danger from the consumption of orange peel containing 2½ p. p. m. of parathion, by man or animals.

Dr. HEDRICK. Do you have auy questions, Mr. Jones?

Mr. JONES. No questions.

Dr. HEDRICK. Mr. McDonough.

Mr. MCDONOUGH. No questions.

Dr. HEDRICK. Mr. Kleinfeld?

Mr. KLEINFELD. A paper entitled "Absorption of DDT and Parathion by Fruits," was presented at the one hundred and fifteenth meeting of the American Chemical Society in 1949 by four representatives of the University of California Citrus Experiment Station.

Are you familiar with the studies they made of that question at that time?

Dr. THIENES. No.

Mr. KLEINFELD. That report shows that based on the weight of the peel only approximately three to five parts per million of parathion were found in the peel of Valencia oranges 6 months after treatment with standard dosages.

Is that in accord with the results of the work you performed?

Dr. THIENES. Well, I don't know how they stored their peel, so I wouldn't know. Our peel was stored in cans with very tight seal. So there was very little opportunity for evaporation until they were

tested. Some of our cans were kept for 6 months, and we found very little evidence of evaporation from our cans.

But without knowledge of how that peel was stored, I wouldn't know how it would compare with ours.

Mr. KLEINFELD. Now, if the orange peel itself is used either in candies or as cattle feed, you have a more serious problem, don't you?

Dr. THIENES. In candies I doubt it.

Mr. KLEINFELD. How about if you use it for cattle feed?

Dr. THIENES. Well, I have no way of knowing directly, but assuming the cattle to be equally sensitive as the rat, I would not be so fearful providing the quantity, the percentage fed, was no greater than that which we fed, namely, 25 percent of the total diet. We found no evidence of injury to our rats with that high concentration of parathion in the peel. We had batches that ran as high as 25 or even 28 parts per million.

Mr. KLEINFELD. In the June 1951 issue of Pharmacy International, there is an article by G. S. Hensill, of the California Spray-Chemical Corp., of Richmond, Calif., entitled, "The 'Newer' Organic Insecticides." Are you familiar with that?

Dr. THIENES. I don't recall it.

Mr. KLEINFELD. In part this is what that publication stated:

> As there is some evidence of build-up of residue in fruit and vegetables, its use has to be restricted to times not too close to harvest. Since parathion is new, there appears to be a considerable amount of information yet to be obtained on usage, residues, and other pertinent matter.

Now, is that in general accord with your thinking on parathion, or different?

Dr. THIENES. Well, he hasn't said much, except that more studies are necessary.

Mr. KLEINFELD. That is right.

Dr. THIENES. And I think that would be true about any of the insecticides. The more we know, the more safely we can handle them.

Mr. KLEINFELD. Well, getting more information on residues is rather important, is it not?

Dr. THIENES. Yes.

Mr. KLEINFELD. Because parathion is a highly toxic substance, isn't it?

Dr. THIENES. As far as our knowledge on oranges is concerned, I think that is pretty well established. I doubt if much more study on the actual amount remaining in the oranges is necessary.

Mr. KLEINFELD. How about when it is used as cattle feed? Do you think we know enough about it now?

Dr. THIENES. I am sorry. I am not familiar with the literature on feeding cattle with this parathion feed, except one study in the Middle West where definite quantities were added, and they were less than the amounts which my study showed to occur.

Mr. KLEINFELD. One last question, sir.

I have a report to the Council on Pharmacy and Chemistry of the American Medical Association entitled, "Pharmacology and Toxicology of Certain Organic Phosphorous Insecticides." It was printed in the Journal of the American Medical Association of September 9, 1950.

The first part of it is by S. A. Rohwer and H. L. Haller, of the Department of Agriculture. The last part of it is entitled "Effects

on Beneficial Forms of Life, Crops, and Soil and Residue Hazards," by Dr. A. J. Lehman, Chief of the Division of Pharmacology, Food and Drug Administration, Dr. Albert Hartzell, head entomologist of the Boyce Thompson Institute for Plant Research, and J. C. Ward, Chief, Pharmacology and Rodenticide Section of the Insecticide Division, United States Department of Agriculture.

In part, this is what these latter people conclude, and I would like to get your reactions to it:

Thus in the case of apples and pears, for example, if parathion is applied strictly in accord with the recommendations of the Bureau of Entomology and Plant Quarantine of the USDA, with particular reference to the time between the last spraying and the harvesting of the fruit, normal weathering should result in parathion residues no greater than a fraction of a part per million.

That is in general line with what you said so far; is that correct?

Dr. THIENES. Well, as you read that, it seems a little indefinite as to time. And of course the amounts we found were much higher than that, but this fruit was picked and processed immediately.

Mr. KLEINFELD. They go on and say:

Traces of this magnitude would not constitute a health problem.

Dr. THIENES. I would agree with that.

Mr. KLEINFELD. But you would not agree if the amounts were greater than——

Dr. THIENES. I have said here, if the amounts were no greater than 2½ parts per million, I would not be afraid of them.

Mr. KLEINFELD. Then they continue as follows:

This is not necessarily true in the case of citrus fruit where the peel itself may constitute food. There is evidence that with the lowest spray concentrations effective in the control of insects and mites on citrus fruits, parathion spray residue on the peel may be as high as two or three parts per million (calculated on the peel basis), this being equivalent to about 0.16 of a part per million based on the whole fruit. The grower, of course, usually has no way of knowing whether or not the peel will ultimately be used for food, and the evaluation of the health hazard resulting from residues such as this is being made at a hearing now in progress. If spray schedules recommended by qualified entomologists are followed, it is quite unlikely that a parathion spray residue problem will become serious.

Are you in general accord with the statements contained herein?

Dr. THIENES. Yes.

Mr. KLEINFELD. And you are in accord with the statement that, although traces of the magnitude described would not constitute a health problem, that is not necessarily true in the case of citrus fruit, where the peel itself may constitute food?

Dr. THIENES. Well, from the point of view of practical diet, I would say that there would be no hazard according to my opinion, for the citrus peel would not make up the total diet under any circumstance in cattle feed. I think 25 percent is the most added. That is my understanding. And concentrations of two or three parts per million in the dried peel would be cut to less than one part per million, and I would not have any fear of poisoning with that being used.

Mr. KLEINFELD. Allowing for a factor of safety to compensate for a possible greater human susceptibility to parathion, what would you consider to be a safe residue level on any one item of the diet for parathion?

Dr. THIENES. Two and one-half parts per million.

Mr. KLEINFELD. I have no further questions.

Dr. HEDRICK. I am interested in knowing just how you washed these oranges.

Dr. THIENES. I didn't wash them; the Fruit Growers Exchange did.

Dr. HEDRICK. You probably supervised it or know something about it.

Dr. THIENES. No; I did not. I have been present when that sort of thing has been done, and I have some experience, but I was not present when the fruit of this particular study was washed.

Dr. HEDRICK. Do you have knowledge of how it was washed—the method?

Dr. THIENES. Only hearsay.

Dr. HEDRICK. Do you think it was run over brushes and all that?

Dr. THIENES. I understand so.

Dr. HEDRICK. You don't know the amount of water that was used?

Dr. THIENES. No, sir.

Dr. HEDRICK. You don't know whether it was washed more than one time?

Dr. THIENES. I do not.

Dr. HEDRICK. That is all.

Dr. THIENES. It was reported to me the ordinary method was used.

Dr. HEDRICK. Thank you.

Who is next?

Mr. KLEINFELD. Before getting off the insecticide picture, we did ask a number of representatives of grower associations to appear if they wanted to. As far as I know, none of them accepted; but, if any of them are here and want to be heard before we go to cosmetics, I am sure the committee would be glad to hear them.

Dr. HEDRICK. Is anyone present who would be interested in testifying? [No response.]

I guess not.

Mr. KLEINFELD. If not, we shall call Dr. Jewel.

(The oath was administered by the chairman.)

TESTIMONY OF PAUL W. JEWEL, PH. D., CHIEF CHEMIST, MAX FACTOR & CO., HOLLYWOOD, CALIF.

Dr. JEWEL. I have submitted a written statement to the committee. Do you still want that read for the record today?

Dr. HEDRICK. How long is your statement?

Dr. JEWEL. It is not very long, a few pages. A goodly portion of it is simply a list of raw materials which the committee asked for. The rest is a description of control tests we use and the way we treat a new substance before allowing it to be put into production.

Dr. HEDRICK. We would like to have your background before you start, Doctor.

Dr. JEWEL. I have a bachelor of science degree in pharmacy from Oregon State College in 1920; a master of science in analytical chemistry from the University of Southern California. That was in 1929. Doctor of philosophy and biochemistry at the University of Southern California School of Medicine, 1932.

During the time I was at the University of Southern California I worked on my master's and doctor's degrees and carried a good deal

of the time the full load of a full professor on organic chemistry, because he was incapacitated during that time. I had a rank of fellow in chemistry but was carrying on the work at that time of a full professor.

I am a member of Phi Lambda Upsilon, Rho Chi, and the American Chemical Society. I am a registered pharmacist in the State of Oregon.

I worked 2 years as junior chemist, pharmaceutical, with the Bureau of Chemistry of the Department of Agriculture. That is the same organization which later became the Food and Drug Administration. I was 1 year and 4 months with the Union Oil Co. of California as a research chemist. Since 1934, I have been chief chemist for Max Factor & Co. in Hollywood.

Dr. HEDRICK. You are not a physician then; are you?

Dr. JEWEL. No. I am an associate referee for the Association of Official Agricultural Chemists working on analytical methods for cosmetic preparations. I have several publications—I have forgotten how many—in the field of analytical and biochemistry.

I am the author of patents covering two dyestuffs which are now known as D & C Red No. 29 and D & C Orange No. 14, and also patents in other fields, including the Union Oil Co. of California.

I believe that covers most of the important biographical data.

Dr. HEDRICK. Will you read your statement.

Dr. JEWEL. I want to point out before I read this that these statements made here are what we do at Max Factor & Co. and naturally have nothing to do, or have nothing to do necessarily, with any other manufacturing company.

Now the control tests. As each lot of any raw material is received, samples are taken and a careful analysis is made to make sure that the material in question meets our very rigid standards.

The specifications we have established follow, in general, those of the United States Pharmacopoeia or National Formulary where applicable, or those of the Toilet Goods Association. In many instances, our standards are much higher than any of the above-mentioned authorities.

It is our attitude that the standards should be as near perfection as industrial production will allow. In other words, if the very best quality that can be attained is 98 percent purity, we allow that; but, if we find that 99 percent or 100 percent is possible, we insist upon that. During the past 15 or 20 years, we have been able to constantly raise our standards as our suppliers found, at our insistence, that better and better quality materials could be prepared.

No raw material may be used in the factory until it bears an O. K. tag from the laboratory. The laboratory number appearing on the O. K. tag becomes a part of the batch record so that each ingredient in any finished product can be checked back to the original source of analysis.

When the manufacturing process is completed, each finished product is again checked by the laboratory to make sure that the factory did its job properly. These finished product tests give adequate control over the manufacturing procedure and assure that the formulation has been correct. This system of controls has proven adequate for the 15 or 16 years it has been used, and we regard it as being entirely satisfactory.

Now, as far as new raw materials are concerned, before any new substance is used in cosmetics, adequate tests are made to establish the fact that it is suitable for use, and harmless to human skin. This is done to protect the consumer and the manufacturer alike.

Since small cosmetic manufacturers do not have sufficient funds to maintain the elaborate research laboratories necessary to prove that any substance is completely safe for use on human skin, it is my opinion that the raw-material supplier should be required to furnish such proof. This in the case of any substance which has not been used safely for many years.

Before any new substance is used by Max Factor & Co., it is tested on animals, and finally on human volunteers, until we are completely sure that it is safe for use. The test methods which we use are mainly our own, although we also use the methods of the Food and Drug Administration. The material to be tested is applied to the clipped skin of guinea pigs for times varying from 24 to 72 hours, or even longer in some cases. Biopsies are then taken, and evaluated microscopically, using a technique, as yet unpublished, which has proven to be very dependable and consistent during the 15 or more years since its original inception. When tests are made on human volunteers, the new substance is made into an appropriate cosmetic, used in the regular manner, and evaluated visually.

Using the above-described routine, we have had no serious complaints during the entire time this system has been in vogue, a period of at least 15 years.

Recommendations: It is my personal opinion, and that of the company I represent, that the present Food, Drug, and Cosmetic Act is entirely adequate in its present form. We favor better enforcement of the present act rather than attempting to improve it by amendments of questionable efficacy.

Here is a list of most of the common raw materials used in the manufacture of cosmetics. It is, of course, not complete because there are many other substances which could and probably have been used. This list will, however, contain most of the currently used materials:

(The list referred to is in the files of the committee.)

Dr. HEDRICK. From the recommendation you have made, you would not care to have any stricter law than we have at the present time?

Dr. JEWEL. I think the present law is sufficiently strict if properly enforced.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. I have one I would like to ask.

What would be your objection, if any, to including on the label the various ingredients that are included in your product?

Dr. JEWEL. I have two or three objections. They may not seem important to you, since you are not actively in the cosmetic business.

Labels of cosmetic preparations are, and used to be in the past, entirely decorative. They were used only to decorate the package and to make certain claims for the efficacy of the preparations they applied to. The cosmetic containers, as a group, do not lend themselves to long, detailed labels. There isn't sufficient room for very much printed material.

Most of the ingredients used in cosmetics are—well, perhaps I should not say most of them, but a lot of them are those which the

average person knows nothing about. It would not be informative to the consumer if he saw the name on the label.

I have no other objections than that. As far as disclosing any composition of the product is concerned, I have no objection to that. I don't think it is important.

Mr. JONES. Do you not think it might be important to the user, if she had an allergy which she had found by consulting a dermatologist was caused by some substance, to be able to read a label and at least be forewarned that if she used that product she might be susceptible to the same irritation she had encountered from the previous product? Do you think that would be helpful?

Dr. JEWEL. That would be helpful to that particular individual, but those cases occur so rarely I don't think it is worth while burdening the industry with additional labeling just to take care of those very few people. The incidence of allergies in cosmetics, believe it or not, is very, very low.

Mr. JONES. What would you say would be the percentage of tolerance as far as irritation was concerned in the use of the product? Out of a thousand women, if it affected some adversely, how many would that have to be before you would feel that you would be justified in keeping it off the market?

Dr. JEWEL. I would hesitate to give you a definite figure on that. I think it would have to be governed in every case by the material under consideration or by the preparation under consideration.

It is extremely dangerous in my estimation to try to make arbitrary statements of that type. There are some things where I would be rather reluctant to market a product if I got any irritations whatever. Other types it might not be important. It is awfully hard to interpret those sort of things.

Mr. JONES. I don't know, and I am not trying to embarrass anyone. But did Max Factor experience the same situation that some other cosmetic manufacturers did from the use of a base coat for nail polish which was later discontinued?

Dr. JEWEL. Very fortunately for Max Factor & Co., we were not making nail enamel at the time. We might have gotten into that if we had been. Although I don't believe we would have gotten into the same trouble the other people did, because we would have given the thing adequate testing before it ever went on the market. I don't think there was any excuse for that at all.

Mr. JONES. Now, another thing. I have noticed that it has only been within recent years there has been a large or widespread use of the material lanolin in advertising that "This product contains lanolin.

I know lanolin has been used for many years, but it is only comparatively recently that different manufacturers of cosmetics have been stressing the fact that it contained lanolin.

Now, is it a common practice in your industry that when one manufacturer begins the use of some material like that, other manufacturers, who have been using comparatively the same formulas, see this one manufacturer using the material and immediately take up and say, "Ours contains the same thing"?

Dr. JEWEL. I think that tendency is altogether too common in the cosmetic industry. Lanolin, as you know, has been used in cosmetics for a long, long time. It may have been, for all I know, the first cos-

metic cream to be used. Actually, as far as lanolin is concerned in the average cosmetic, I don't think the average person could tell whether it was in there or not. I don't think it makes a bit of difference.

Mr. JONES. Is it not a fact that numerous manufacturers do use that, and they say, "This product contains lanolin," whether it is soap, hairdressing, shampoo or things like that?

Dr. JEWEL. They do that, and by inference claim that the amount of lanolin is beneficial, and I don't think it is particularly good policy. I think they could well avoid it.

Mr. JONES. It is just within recent years they have begun doing that to any considerable extent, is it not?

Dr. JEWEL. It hasn't been too recently. I think it has been 15 or 20 years anyway. I recall the first mention being made of lanolin as a selling point in cosmetics not long ago.

Mr. JONES. I was under the impression it was later than that. It seemed like it was just 5 or 10 years I have seen the widespread mention of it in advertising.

Dr. JEWEL. It was much longer ago than that, I am sure.

Mr. JONES. No further questions.

Dr. HEDRICK. Mr. McDonough.

Mr. MCDONOUGH. If lanolin were in a cream or a hairdressing, how could you analyze it to find out whether it was lanolin or not?

Dr. JEWEL. We have analytical methods for that.

Mr. MCDONOUGH. You can discover lanolin as a fat?

Dr. JEWEL. With considerable precision, yes; an error of plus or minus 1 percent, thereabouts.

Mr. MCDONOUGH. Do the average cosmetic manufacturers that are in the same category as Max Factor take the same precautions, do you know?

Dr. JEWEL. I couldn't testify to such. I don't know.

Mr. MCDONOUGH. That is all.

Dr. HEDRICK. How many employees do you have at your factory?

Dr. JEWEL. I can't answer that question. Several hundred. It varies so greatly from month to month, I would have to make a very wild guess.

Dr. HEDRICK. Do you think 5,000, or 1,000?

Dr. JEWEL. Less than that. Probably two or three hundred.

Dr. HEDRICK. How long has this company been in business?

Dr. JEWEL. I think in California since about 1906 or 1908. At that time, of course, it was a very small company. I believe at that time they were doing most of their business with the movie studios, that is, mostly professional make-up. I don't know just when they started making cosmetics for sale over the counter. When I went there in 1934 they were already well into that phase of the business.

Dr. HEDRICK. Do you have any questions, Mr. Kleinfeld?

Mr. KLEINFELD. A few.

Dr. Jewel, you say that it is your personal opinion and that of the company you represent that the present Food, Drug, and Cosmetic Act is entirely adequate in its present form; that you favor better enforcement of the present act rather than attempting to improve it by amendments of questionable efficacy.

Please explain what you mean by "better enforcement".

Dr. JEWEL. I think that is fairly obvious. Simply more careful attention to the violators as they come along. I think a lot of violations of the Food, Drug, and Cosmetic Act are not prosecuted, and not even cited.

Mr. KLEINFELD. Let me ask you a question and see how better enforcement would have helped these people I will mention.

Very recently some dry shampoos were put on the market which contained a wetting agent and a quarternary compound which caused semipermanent blindness to some women. After that had occurred, the Food and Drug Administration seized the product. Then the product was taken off the market. How would better enforcement of the present act have avoided this injury to these women's eyes?

Dr. JEWEL. I can't answer that very intelligently because I am not a lawyer.

Mr. KLEINFELD. Answer it as best you can.

Dr. JEWEL. I don't know all the intricacies of the enforcement of the law, but there is——

Mr. KLEINFELD. If you don't know the intricacies of the present law, how can you say that better enforcement is needed?

Dr. JEWEL. I don't know all of them, I know some of them.

That is a case where I don't know that any law would have stopped it, actually, because I don't think it ever occurred to anybody before this happened to have to drop shampoo in anybody's eyes to see what would happen. Shampoo was made to wash the hair with and not intended to get into the eyes, except as it does accidentally in diluted form.

Mr. KLEINFELD. You mean it didn't occur to the manufacturer of shampoos that ladies would get it in their eyes?

Dr. JEWEL. Only in highly diluted form, after diluted with water.

Mr. KLEINFELD. In any form, don't you think they ought to make tests before they put it on the market?

Dr. JEWEL. They should; yes.

Mr. KLEINFELD. How would better enforcement of this act have prevented this from happening?

Dr. JEWEL. Well, you got me on that point. I think probably the best law—the present law might not be adequate. I don't know you could stop it with any sort of law.

Mr. KLEINFELD. Supposing the law required a man who wanted to put a shampoo on the market to make tests with it. You make tests, don't you?

Dr. JEWEL. Yes.

Mr. KLEINFELD. Why do you make tests?

Dr. JEWEL. We make tests to protect ourselves and customers.

Mr. KLEINFELD. Supposing the law required all cosmetic manufacturers, not only the more reputable ones, to make these tests, to submit data as far as new products were concerned and their ingredients to some governmental agency to show that they had made the tests and that people would not be hurt. Now, is that asking too much of the cosmetic manufacturer?

Dr. JEWEL. It depends upon what the testing involves. A lot of these cosmetic manufacturers are so small that they don't have funds to carry out extensive research programs for testing materials.

Mr. KLEINFELD. Then must we take the risk that people are going to be hurt by these products?

Dr. JEWEL. No, I think that they should be able to depend on the manufacturers of those materials to protect them.

Mr. KLEINFELD. Supposing the manufacturer is selling material and he says he has made tests, to whom should he submit that data?

Dr. JEWEL. I think it would be adequate if he submitted those tests or proof of the fact that the material was safe to use to the person who contemplated using it in the form of guaranty of suitability for use.

Mr. KLEINFELD. How about the finished product?

Dr. JEWEL. The finished product is, of course, the responsibility of the manufacturer, naturally.

Mr. KLEINFELD. Whom should he satisfy that his finished product, with these ingredients, would not hurt anybody?

Dr. JEWEL. I know what we would do, but I don't know what others would do. We never would let that get far along.

Mr. KLEINFELD. I am sure you would not. I am trying to find out how the public can be protected as far as the cosmetic industry is concerned. What you said was required is better enforcement of the present act.

Dr. JEWEL. In my opinion a lot of these people, unaware of the things that could happen to them even if the law required a very strict licensing of these materials, or examination of these materials, would probably go ahead and use them with not any testing of any kind anyway, disregarding the law.

Mr. KLEINFELD. Do you know the present law now requires, in the case of a new drug that before a manufacturer may place it on the market he must present to the Food and Drug Administration evidence that his drug is safe when used as directed? And that such provision has been in existence for about 10 years now, and that that is what the manufacturers do? As far as I know, in all the 10 years there have been only perhaps one or two cases where someone tried to put a new drug on the market without getting the approval required by law.

Now if the law made it a criminal violation for a cosmetic manufacturer to distribute a product, an untested product, until he had presented evidence of the safety to the Food and Drug Administration, wouldn't that check the use of untested cosmetics?

Dr. JEWEL. I don't think it would. I think that unscrupulous manufacturers would go ahead and use it anyhow.

Mr. KLEINFELD. How about the nail lacquer people—were they small-marginal operators?

Dr. JEWEL. They were big enough people they should have known better.

Mr. KLEINFELD. Should have known better?

Dr. JEWEL. Yes.

Mr. KLEINFELD. Were they unscrupulous?

Dr. JEWEL. I honestly think that it would have been a very difficult thing to have detected that trouble on nails, unless they were subject to a lot more stringent testing than anybody suggested so far that I know about. It was entirely unanticipated, nonanticipatable.

Mr. KLEINFELD. Couldn't adequate testing have prevented that from happening?

Dr. JEWEL. It depends on what you mean by adequate.

Mr. KLEINFELD. The kind of testing you use.

Dr. JEWEL. If you had had 100, 1,000, or even 10 women using this product for a year's time before putting it on the market you probably would have caught it. But I don't know if many of these companies would hold still for a thing like that or not. I think they tend to bypass the law rather than to comply with it.

Mr. KLEINFELD. Should not they hold still and see that the product wouldn't hurt anybody?

Dr. JEWEL. That would be my reaction. I certainly would do it.

Mr. MCDONOUGH. Will the counsel yield?

Mr. KLEINFELD. Yes.

Mr. MCDONOUGH. Is there any clause in the contract of motion picture actors that you prepare the make-up for, that if any of the cosmetics affect their skin deleteriously that they can sue the manufacturer or the studio?

Dr. JEWEL. I don't know.

Mr. MCDONOUGH. Do you know of anything like that?

Dr. JEWEL. I don't know of any such contract, no.

Mr. MCDONOUGH. Do you think that the laws of the various States should make provision for the testing of the materials that go into these things, as well as the Federal law?

Dr. JEWEL. Well, a good many States have laws patterned after the Food and Drug Act, and when the provisions of the Federal law on cosmetics were passed they proceeded to pass cosmetic amendments or additions to their State law. I don't know whether California has done that. I don't believe they have.

Mr. MCDONOUGH. Do you have any problem with the State Health Department at all, or any relationship, friendly or otherwise, in the course of your manufacturing?

Dr. JEWEL. We know them, of course; we don't have any trouble with anybody.

Mr. MCDONOUGH. You conform to, or exceed the requirements?

Dr. JEWEL. Not only that, but we were exceeding the requirements 5, 6, or 7 years before the law was ever passed.

Mr. MCDONOUGH. What I am getting at—we have heard testimony here about the extent to which the State of California goes to protect the consuming public and operators, growers of fruit and vegetables, from sprays and insecticides, which is very necessary. Now, do you think the State law should be reinforced at all to protect the public against unscrupulous manufacturers of cosmetics where the health of the individual may be affected?

Dr. JEWEL. Well, in general, I would say that the State laws should be in conformity with the Federal laws, because if they are not, then the State and the Federal Government are trying to enforce two different kinds of laws and there will always be confusion arising. I don't know why the State hasn't passed a cosmetics act, if they haven't passed it. But I know of no cases right now where lack of a State law has been in any way harmful to the people.

Mr. MCDONOUGH. Well, the personnel standards of the State require cosmetologists to obtain licenses to practice in this State, do they not?

Dr. JEWEL. That involves beauty parlors, does it not?

Mr. MCDONOUGH. That is right. But they have to pass the standards of the State of California before they can practice.

Dr. JEWEL. They have to obtain licenses by the State; yes.

Mr. McDONOUGH. That is a matter of protection to the public. Perhaps there should be some precaution added to the law insofar as any deleterious material that may get into a cosmetic in the State of California, or any State in the Union is concerned.

Dr. JEWEL. I wouldn't want to testify on that at all. I have no opinion one way or the other on that, really. We have had no trouble with the State law so far. We have had no troubles that I know of on account of the presence or lack of a State law.

Mr. McDONOUGH. You are undoubtedly in an exceptional position. I mean your firm has been very cautious about these things. I suppose the same thing applies to some of the other large cosmetic manufacturers.

Dr. JEWEL. I should imagine it would, but I don't feel competent to testify for them, if you don't mind.

Mr. McDONOUGH. All right.

Mr. KLEINFELD. In the beginning of your statement you said:

> Before any new substance is used in cosmetics, adequate tests are made to establish the fact that it is suitable for use and harmless to human skin.

What do you mean by "adequate tests"?

Dr. JEWEL. By adequate tests there, I mean what tests we have found by experience to be necessary. Now that will vary, of course, from one substance to another. There are many substances offered on the market for use in cosmetics which we wouldn't even investigate because I feel that they inherently have no place in cosmetics at all.

If we feel that it has a place in cosmetic application, and we don't at the same time feel it has a place in cosmetics, we will go ahead and investigate it.

Our investigation begins, as I have indicated in my statement, by first making animal tests, and applied to animal skins by the technique indicated there. We don't use 200 or a thousand animals that some people talk about, because I don't think it is necessary. We use usually groups of 10.

We may test four or five substances on one animal at one time, as far as that is concerned, by shaving little islands in the fur so those little islands are isolated from the rest of the tests. We frequently make more than one test on the same animal.

After that skin has been exposed to that substance for 24 hours for acute irritation, and 72 hours for little less acute, we take biopsies and evaluate those slides by techniques developed in our own laboratory. Those are the beginning tests.

After that, if that shows no indication of any difficulty, we make up this finished cosmetic product, whether a lipstick, cosmetic, whatever, and use it on a group of women we have available on the plant—anywhere from 10 to 50 of them—for a period of time until we feel sure it is not doing any harm. We set no arbitrary standards of time. We set no arbitrary standards of numbers. We have been doing it so long we feel we can tell whether it is going to be all right.

Mr. KLEINFELD. You said you make these tests because you want to assure yourself your customers are not hurt.

Dr. JEWEL. That is right.

Mr. KLEINFELD. So that if other cosmetic people are not making similar tests they are not taking the precautions that are necessary; is that correct?

Dr. JEWEL. I think they all do something. They may not be able to do it quite so elaborately, but at least they do some amount of presale testing. I don't know positively, but as far as I know, they all do.

Mr. KLEINFELD. How do you explain these occurrences—for example, let me read to you one paragraph from a letter we got from the Food and Drug Administration:

About 4 years ago numerous complaints were received from women whose fingers had been significantly injured as a result of using lacquers marketed in the form of fingernail coatings. Again the ingredients employed were different kinds of newly developed products related to synthetic rubber and no adequate testing was undertaken prior to marketing the coatings to determine whether they might have any propensity for injury. These products were exceedingly complex organic chemicals, more in the nature of mixtures than specific entities, and the only practical approach to evaluating their properties for harm is adequate tests on lower animals or human beings. Because of the complex chemical character of the ingredients, it was very difficult to determine the precise nature of the offending constituents and it became necessary to regard each batch or lot as an entity unto itself and to undertake individual testing. Again, lack of adequate pretesting and experimenting on the public with unknown chemicals resulted in substantial injury to many users of this type of cosmetic. Finally, by belated study and experimentation, manufacturers were able to produce satisfactory articles without deleterious ingredients.

Now if they were able to do it finally, don't you think it should have been done in the first place?

Dr. JEWEL. I think they should have done it in the first place. I am not defending them at all. I think they did wrong completely. We would not have done it, and I don't think anybody should have. I don't know that you can compel them by law. You might a company like that particular one. I think you will find dozens of little companies.

Mr. KLEINFELD. Should we not try to do our best to see that a satisfactory law is passed and enforced?

Dr. JEWEL. I think the present law, with the knowledge anybody in their right mind has, that if they do something that is going to hurt somebody they are going to get caught at it—if they knew the law was going to be enforced, it would be sufficient deterrent not to do it in the first place.

Mr. KLEINFELD. But the dry-shampoo incident which caused damage to women's eyes just occurred. The Food and Drug Administration can step into the picture and seize the products and prosecute the people responsible, but that won't particularly help the women who have been hurt, will it?

Dr. JEWEL. No; but I would be willing to make you a wager that is the first time, and starting as of that time, the first time anybody ever tested shampoo in any kind of an eye before, animal or otherwise.

Mr. KLEINFELD. I should think that is a sad commentary on the cosmetic industry.

Let's talk about control tests. I want to ask if they are essential and should be followed by others. You said:

As each lot of raw material is received samples are taken and a careful analysis is made to make sure that the material in question meets our very rigid standards.

You believe that is an essential thing to do?

Dr. JEWEL. I wouldn't miss it for a moment.

Mr. KLEINFELD. You say:

No raw material may be used in the factory until it bears an O. K. tag from the laboratory. The laboratory number appearing on the O. K. tag becomes a

part of the batch record so that each ingredient in any finished product can be checked.

Do you believe that to be essential, too?

Dr. JEWEL. I do.

Mr. KLEINFELD. And you say:

When the manufacturing process is completed, each finished product is again checked by the laboratory to make sure that the factory did its job properly. These finished product tests give adequate control over the manufacturing procedure and assure that the formulation has been correct.

Do you believe such checks of finished products are also necessary?

Dr. JEWEL. I don't see how you can do business without it.

Mr. KLEINFELD. You think all ought to do that?

Dr. JEWEL. They might not all be able to do it as completely as we do. Perhaps they haven't the funds to finance the staff, but they could do some sort of test. It wouldn't have to be as elaborate as we use—some simple thing, which would assure them the material they are making is what it is supposed to be.

I don't know about the others, but I should think if they were at all good businessmen, they would only buy raw materials from the most reputable suppliers. If they do, and if our records mean anything, they are not going to get anything bad from those people very often. I think we have had to return lots of raw materials less than a dozen times in the last 15 years from the people we buy from.

Mr. KLEINFELD. But these control tests on batches are very important, are they not, Dr. Jewel?

Dr. JEWEL. I regard them as being important; yes.

Mr. KLEINFELD. In fact, essential?

Dr. JEWEL. I wouldn't operate a business without them.

Mr. KLEINFELD. I have no other questions.

Dr. HEDRICK. Doctor, in your laboratory down there, have you ever tested any animals, mice, or rats, on estrogenic hormone face creams in regards to cancer?

Dr. JEWEL. We have done no tests on hormone creams of any kind.

Dr. HEDRICK. You make them, do you not?

Dr. JEWEL. No; we have never made a hormone cream.

Dr. HEDRICK. Do you know how many companies make them?

Dr. JEWEL. No; I don't know. There are a lot of them. I don't know how many.

Dr. HEDRICK. Any other questions?

Mr. JONES. I have no more.

Dr. HEDRICK. Thank you very much, Dr. Jewell.

The committee will stand adjourned until tomorrow at 9:30.

(Whereupon, at 4:30 p. m., the committee recessed to reconvene in the same room at 9:30 a. m., Saturday, November 24, 1951.)

CHEMICALS IN FOODS AND COSMETICS

SATURDAY, NOVEMBER 24, 1951

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE TO INVESTIGATE THE
USE OF CHEMICALS IN FOODS AND COSMETICS,
Los Angeles, Calif.

The select committee met (pursuant to H. Res. 74 and H. Res. 447, 82d Cong., 1st sess.; continuing the investigation and study begun under authority of H. Res. 323, 81st Cong., 2d sess.) at 9:30 a. m., in room 229, United States Post Office and Court House Building, Los Angeles, Calif., Hon. E. H. Hedrick presiding.

Present: Representatives Hedrick of West Virginia, Jones of Missouri, and McDonough of California.

Also present: Vincent A. Kleinfeld, chief counsel, and Alvin L. Gottlieb, associate counsel.

Dr. HEDRICK. The committee will please come to order.

Who is your first witness, Mr. Kleinfeld?

Mr. KLEINFELD. Mr. Chairman, I have from the editorials and comments section of the Journal of the American Medical Association, March 10, 1951, an article entitled "Insecticide Storage in Adipose Tissue," which discusses DDT storage. I suggest it be made part of the record.

Dr. HEDRICK. If there is no objection, it is so ordered:

(The article referred to is as follows:)

INSECTICIDE STORAGE IN ADIPOSE TISSUE

Administration of drugs which have cumulative properties requires greater caution than is needed with substances that have little or no tendency for tissue storage. In some instances the accumulation of certain chemicals may do no more than local harm, as in the case of the deposition of silver in the skin, which produces argyria, or of fluoride in the teeth, which produces mottled enamel. When the chemicals begin to pile up in parenchymatous tissues, retention becomes important. There are a few instances where cumulative effect of a chemical is desirable; e. g., the effectiveness of digitalis depends on its accumulation in the tissues, and the therapeutic value of iodine depends on its deposition in the thyroid gland. For the most part, however, tissue build-up of a toxicant is undesirable; e. g., the retention of heavy metals by the liver and kidneys. Clinical tests have been devised to detect aberration of functions in these and other tissues, and the collection of dangerous amounts of cumulative chemicals can be kept under control. Little attention, however, has been given to adipose tissue. It is a matter of record that the newer chlorinated hydrocarbon insecticides possess a strong tendency to accumulate in the body fat, and the influence of such deposition of poisonous material in functioning tissue which comprises approximately 18 percent of the body weight appears to have been overlooked.

Adipose tissue is not merely connective tissue which functions in a passive manner as a fat depot; it is also a structure possessing functions that have been compared to those of a ductless gland.[1] It has its origin in a primitive fat organ[2]

[1] Wells, H. G.: Adipose Tissue: A Neglected Subject, J. A. M. A. 114: 2177 (June 1) 1940.
[2] Hausberger, F. X.: Abstract, Verhandl. d. Gesellsch. f. Verdauungs u. Stoffwechselkrankh. Fourteenth meeting, 1938.

and retains the independent special function of fat deposition when transplanted to another site in the same subject or even when the embryonic tissue is transplanted into the normal adult animal of the same species.[3] The tissue has a rich blood supply, and the mobilization and deposition of the fat is regulated by endocrine as well as nervous (sympathetic) influences. Although the presence of a number of enzymes in adipose tissue has been reported, it is not clear whether these enzymes are derived from the fat cells or from the blood. Nevertheless, enzymatic activity is carried out by the fat cells, which can accumulate glycogen, change carbohydrates into fat and transform one fatty acid into another. It has been asserted that, as part of the reticuloendothelial system, blood-forming functions may become established in adipose tissues under appropriate conditions,[4] and that the cells of the omentum are capable of forming antibodies.[5] The functions bearing directly on the mobilization and deposition of fat appear to be a continuous process. Complete fat turn-over in the mouse on a constant diet is estimated to require 6 days.[6] The turn-over in man is probably slower, because his metabolic rate is lower; it most likely varies within wide limits and must be greatly accelerated under conditions that make demands on the fat reserve.

It appears to be a reasonable assumption that adipose tissue, which has these many important functions, can be influenced by the presence of cumulative poisons such as the chlorinated hydrocarbon insecticides. Among the more important of these materials are dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethane (TDE), chlordane, methoxychlor, dieldrin, toxaphene and the isomers of benzene hexachloride. The accumulation of dichlorodiphenyltrichloroethane in fat tissue has been studied extensively, and it has been shown that this tissue acts as a biologic magnifier for the insecticide.[7] The ingestion of minute amounts of dichlorodiphenyltrichloroethane (about 1 part per million) in the diet of rats over a period of time causes accumulation in the fat which can be as high as 30 times the level of intake. It has been demonstrated that dichlorodiphenyltrichloroethane concentrations of 3 to 30 parts per million in the substrate inhibit rat heart cytochrome oxidase.[8] It is possible that this deposited DDT can influence enzymatic activity in adipose tissue. Furthermore, during the mobilization and deposition of fat, which involved the liver, the small but numerous insults experienced by the liver in metabolizing the dichlorodiphenyltrichloroethane-laden fat could lead to damage of this organ. At least minimal liver damage has been reported in animals that ingested DDT, at a rate of 5 parts per million in the diet, for prolonged periods.

Perhaps a better indication of the influence of a poison that is retained in the fat is the comparison of the effects of the four principal isomers of benzene hexachloride. If the degree or retention of a gamma isomer in fatty tissue is assigned the value of 1, then alpha is rated as 2, beta as 10 and delta less than 1. Chronic effects of these isomers, when fed to rats, can be observed with 100 parts of gamma per million in the diet, 50 of alpha, 10 of beta and about 800 of delta. The direct relation between retention and chronic toxicity appears obvious.

The methoxy analog of dichlorodiphenyltrichloroethane, methoxychlor, also has an effect on enzymes similar to that of dichlorodiphenyltrichloroethane. However, no deposition in fat occurs, probably because the breakdown of the compound is so rapid in the body that none of the material is available for fat storage. Methoxychlor has a low order of chronic toxicity. Dichlorodiphenyldichloroethane, another analog, is stored in body fat to an even greater extent than dichlorodiphenyltrichloroethane,[9] but its chronic effect is only half that of dichlorodiphenyltrichloroethane. This is an exception which at present is unexplained.

Chemical methods for the detection of chlordane, dieldrin, aldrin and toxaphene in biologic materials have not yet been applied to tissue storage studies of

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[3] Wertheimer, E., and Shapiro, B.: The Physiology of Adipose Tissue, Physiol. Rev. 28: 451, 1948.

[4] Wassermann, F.: Die Fettorgame des Menschen: Entwicklung, Bau und systematische Stellung des sogennanten Fettgewebes, Ztschr. Zellforsch. u. mikr. Anat. 3: 235, 1926.

[5] Portis, B.: Role of Omentum of Rabbits, Dogs, and Guinea Pigs in Antibody Formation, J. Infect. Dis. 34: 159, 1924.

[6] Schoenheimer, R., and Rittenberg, D.: Deuterium as an Indicator in the Study of Intermediary Metabolism: VI. Synthesis and Destruction of Fatty Acids in the Organism, J. Biol. Chem. 114: 381, 1936.

[7] Laug, E. P.; Nelson, A. A.; Fitzhugh, O. G., and Kunze, F. M.: Liver Cell Alteration and DDT Storage in the Fat of the Rat Induced by Dietary Levels of 1 to 50 p. p. m. DDT, J. Pharmacol. & Exper. Therap. 98: 268, 1950.

[8] Johnston, C. D.: Division of Pharmacology, Food and Drug Administration, unpublished data.

[9] Woodard, G.; Davidow, B., and Nelson, A. A.: Effects Observed in Dogs Following Prolonged Feeding of DDT and Its Analogs, Federation Proc. 7; 267, 1948.

these compounds. Chlordane has a high order of chronic toxicity; dieldrin and aldrin have a toxicity that appears to be equal to if not above that of chlordane. Such information as is available indicates that all of these compounds are stored in fatty tissues.

The influence of the stored insecticides may not be limited to adipose tissue. In fact, dichlorodiphenyltrichoroethane is found in all other tissues in proportion to their fat content. Fats and lipids are constituents of cell membranes and are concerned with the phenomena of cell permeability and cell organization in every tissue of the body. Also, embryonic fat cells have a great capacity for synthesis of cholesterol. The importance of cholesterol in the formation of vitamins and hormones is well established.[10] Consequently, storage of a toxicant in the fat of parenchymal cells is essentially storage in the cell itself, where such important enzymatic processes as oxidation, phosophorylation and cholesterol synthesis take place. The fact that TDE specifically affects the adrenal cortex of the dog gives credence to this postulation.[11]

At present, compounds of the chlorinated hydrocarbon group of insecticides that are fat soluble and chemically stable appear to be readily retained in adipose tissue. Such compounds possess a high order of chronic toxicity, and it is believed that at least part of these effects may be due to the adverse influence the chemicals have on important functions of adipose tissue. A review of the pharmacologic and toxicologic aspects of dichlorodiphenyltrichloroethane, one of the better known members of this group of chemicals, is presented elsewhere in this issue of The Journal as a report of the committee on pesticides, a standing committee of the Council on Pharmacy and Chemistry.

Mr. KLEINFELD. Mr. Nethercutt.

(The oath was administered by the chairman.)

TESTIMONY OF J. B. NETHERCUTT, REPRESENTING MERLE NORMAN COSMETICS, INC., AND NETHERCUTT LABORATORIES, SANTA MONICA, CALIF.

Mr. KLEINFELD. Mr. Nethercutt, whom do you represent?

Mr. NETHERCUTT. I represent the Merle Norman Cosmetics, Inc., and Nethercutt Laboratores, 207 Norman Place.

Mr. KLEINFELD. What position do you hold?

Mr. NETHERCUTT. I am owner of the Nethercutt Laboratories. I am the sole supplier of cosmetics to Merle Norman Cosmetics, Inc., and they are my sole customers.

Mr. KLEINFELD. What is your technical background and training?

Mr. NETHERCUTT. I attended the City College of Santa Monica, Calif., and the California Institute of Technology.

Mr. KLEINFELD. Have you training in chemistry?

Mr. NETHERCUTT. Yes.

Mr. KLEINFELD. What degree do you have?

Mr. NETHERCUTT. I have no degree.

Mr. KLEINFELD. What functions do you perform for these corporations?

Mr. NETHERCUTT. The Nethercutt Laboratories is not a corporation. It is individually owned. I am, as I say, the owner of this business, and my duties are varied, as they would be in any small business. I am responsible for the production of cosmetics, the maintaining of adequate standards, personnel relations, and financial problems are also within my scope.

Mr. KLEINFELD. Please read your statement.

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[10] Thannhauser, S. J., and Schmidt, G.: Lipids and Lipidoses, Physiol. Rev. 26: 275, 1946.

[11] Nelson, A. A., and Woodard, G.: Severe Adrenal Cortical Atrophy (Cytotoxic) and Hepatic Damage Produced in Dogs by Feeding 2,2-Bis (Parachlorophenyl)-1,1-Dichloroethane (DDD or TDE), Arch. Path. 48: 387 (Nov.) 1949.

Mr. NETHERCUTT. In accordance with your request we are submitting a list of all the ingredients used in the cosmetics manufactured by us. Tests which we conduct on these ingredients are numerous and varied to insure that each ingredient meets our specifications. In some instances our specifications consist of standards set by ourselves and in others they parallel the standards set by the United States Pharmacopeia, national formulary or the board of standards of the Toilet Goods Association. In addition to testing of all raw materials, new raw materials intended for use in our products and all of our finished products intended for distribution to the public are subjected to physiological testing including tests for acute toxicity, chronic toxicity, chemical irritation, and allergenic response.

In our opinion, present legislation covering the cosmetic industry is adequate and it would be our recommendation that the laws which we already have be properly enforced.

The materials used in cosmetic manufacturing are as follows:

(The list referred to is in the committee files.)

Dr. HEDRICK. Do you mean to say that our laws are not being enforced now?

Mr. NETHERCUTT. I don't believe they are being properly enforced or that the most is being made of them.

Dr. HEDRICK. What do you mean by "properly"?

Mr. NETHERCUTT. I don't believe that the Food and Drug Administration is enforcing the provisions of the Food, Drug, and Cosmetics Act, which relate to the inclusion of poisonous and deleterious substances in cosmetics.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. I notice you say these tests which you made are varied, and so forth. Do you maintain your own laboratory where you actually conduct these toxicity tests?

Mr. NETHERCUTT. Yes. We established such a laboratory in 1937 and have maintained it consistently since that time. It is adequately staffed with qualified personnel. We conduct all of the tests that we feel adequate and some that are perhaps not entirely required.

Mr. JONES. Do you use animals for these tests or do you use humans?

Mr. NETHERCUTT. Yes, we do use both animals and humans and we maintain an animal colony.

Mr. JONES. What is the extent of the staff you have there?

Mr. NETHERCUTT. Normally it is four men. At the present time we are understaffed by the loss of one man.

Mr. JONES. Do those men hold degrees and are they recognized as toxicologists?

Mr. NETHERCUTT. Dr. Smith is a doctor of medicine. We have two chemists who hold degrees. I can't tell you from what school, but they have bachelor of science degrees.

Mr. JONES. Does Dr. Smith devote his full time to your laboratory?

Mr. NETHERCUTT. No; he does not.

Mr. JONES. He has a practice?

Mr. NETHERCUTT. He has outside interests and devotes half of his time to our laboratory.

Mr. JONES. He is the one that supervises the tests carried on in the laboratory?

Mr. NETHERCUTT. He supervises the tests, and in some instances runs them himself.

Mr. JONES. What percentage of the items that you use have been subjected to tests by your laboratory?

Mr. NETHERCUTT. All of them, 100 percent.

Mr. JONES. You mean every item that goes into your cosmetics has been tested by your laboratory?

Mr. NETHERCUTT. All that go into our cosmetics have been tested by our laboratory, not once, but repeatedly.

Mr. JONES. I take it that this list you gave us means all of these substances are used in your cosmetics.

Mr. NETHERCUTT. Yes.

Mr. JONES. And you say all of them have been tested?

Mr. NETHERCUTT. Yes.

Mr. JONES. And you say you are the sole supplier of the—what is the name?

Mr. NETHERCUTT. Merle Norman Cosmetics.

Mr. JONES. You are their sole supplier and they are your sole customer?

Mr. NETHERCUTT. Yes.

Mr. JONES. Are you interested in that company, also?

Mr. NETHERCUTT. Not financially.

Mr. JONES. Not financially?

Mr. NETHERCUTT. No.

Mr. JONES. No further questions.

Dr. HEDRICK. How many chemicals did you have to reject as not being usable?

Mr. NETHERCUTT. I couldn't answer that question. There are numerous chemicals that we will not allow to be used in our cosmetic preparations.

Dr. HEDRICK. Do you use the patch test in many of them?

Mr. NETHERCUTT. Yes; they are all subjected to patch tests, scratch tests.

Dr. HEDRICK. You mean if there is any reaction whatsoever from a patch test you reject them?

Mr. NETHERCUTT. I can't say that because I am not qualified to evaluate the results of those tests.

Dr. HEDRICK. You leave that up to your physician?

Mr. NETHERCUTT. Yes.

Dr. HEDRICK. Any questions, Mr. Kleinfeld?

Mr. KLEINFELD. Yes.

Is this list of ingredients which you have furnished the committee a complete list of all the ingredients you have used and are using in your cosmetics?

Mr. NETHERCUTT. Yes; to the best of my knowledge.

Mr. KLEINFELD. Exactly what products do you manufacture?

Mr. NETHERCUTT. A complete line of cosmetics. I couldn't begin to name them all. I can give you some if you wish.

Mr. KLEINFELD. Give me some.

Mr. NETHERCUTT. Cold cream, foundation cream, face powder, rouge, eye shadow, lubricating creams, shampoos, sachet, lipstick, colognes, shaving creams, after-shave lotions, hair dressings, hair oil. I am afraid I have lost myself. That is about as far as I can go.

Mr. JONES. Nail polish?

Mr. NETHERCUTT. Yes.

Mr. KLEINFELD. How many people do you employ?
Mr. NETHERCUTT. Normally from 125 to 170.
Mr. KLEINFELD. Do you make any shampoos?
Mr. NETHERCUTT. Yes.
Mr. KLEINFELD. Do you make tests of your shampoos on animals?
Mr. NETHERCUTT. Yes.
Mr. KLEINFELD. Do you put the shampoo product in their eye?
Mr. NETHERCUTT. Yes.
Mr. KLEINFELD. You think that is an advisable thing to do that?
Mr. NETHERCUTT. Yes.
Mr. KLEINFELD. You have said that in your opinion present legislation is adequate and it would be your recommendation that the laws which we already have be properly enforced.

We have heard a lot of generalizations to that effect. Please be specific. How would better enforcement be possible and what would it do?

Mr. NETHERCUTT. The present law states, in my words, that no poisonous, deleterious, putrid, decomposed substance be present in a cosmetic. To the best of my knowledge, the Food and Drug Administration has not once advised cosmetic manufacturers of any ingredient which should not be included in a cosmetic and might be considered in the categories I have mentioned.

Mr. KLEINFELD. Do you know whether any cosmetic manufacturers have asked the Food and Drug Administration whether a particular ingredient or ingredients are or are not poisonous or deleterious?

Mr. NETHERCUTT. I have no knowledge of such question.
Mr. KLEINFELD. Have you?
Mr. NETHERCUTT. No.
Mr. KLEINFELD. If cosmetic manufacturers are concerned about this, as you apparently are, why don't you, or other cosmetic manufacturers, ask Food and Drug's opinion before they use these ingredients?

Mr. NETHERCUTT. I can answer that question from my own standpoint, not from other cosmetic manufacturers.

Mr. KLEINFELD. Please answer from your own standpoint.

Mr. NETHERCUTT. Because when cosmetic colors first were set up as certifiable by the Food and Drug Administration, we had a vast fund of knowledge on one particular cosmetic color which was included in the list for certification by the Food and Drug Administration, and which since then has been certified.

We sent all of this information in to the Food and Drug Administration, and the information pointed out in no uncertain terms that the color was deleterious when used in certain combinations with well-known cosmetic materials. We were not accorded any reply and there was no action taken whatsoever. From that lack of action taken by the Food and Drug Administration, I did not trust their cooperation.

Mr. KLEINFELD. You mean you wrote to the Food and Drug Administration and you did not get any answer?

Mr. NETHERCUTT. That is correct.
Mr. KLEINFELD. Do you have a copy of the letter you wrote?

Mr. NETHERCUTT. It is so long ago I don't know whether it is still in the records or not.

Mr. KLEINFELD. Will you look and try to find it?

Mr. NETHERCUTT. I will.

(The letters referred to were subsequently submitted to the committee and are as follows:)

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOOD AND DRUG ADMINISTRATION,
Washington, D. C., September 28, 1938.

Re Hansa yellow, Schultz Index No. 84.

Mr. J. B. NETHERCUTT,
Nethercutt Laboratories,
Ocean Park, Calif.

DEAR SIR: This color is being considered as an addition to a tentative list of colors being prepared for certification, but before it can be listed, we must have its formula, which we are requesting that you send to us by return mail.

Very truly yours,

HERBERT O. CALVERY,
Chief, Division of Pharmacology.

OCTOBER 5, 1938.

UNITED STATES DEPARTMENT OF AGRICULTURE,
Food and Drug Administration, Washington, D. C.

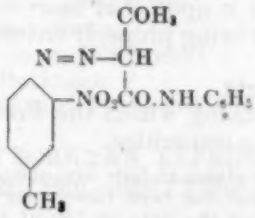
(Attention: Mr. Herbert O. Calvery.)

DEAR SIR: As requested in your letter of September 28, we are sending the formula for Hansa yellow, Shultz Index No. 84, as copied from the Shultz Index:

Hansa yellow, Shultz Index No. 84:

Diazo dye

$C_{17}H_{16}N_4O_4$



Certain tests which we have performed as an attempt to determine the toxicity of this color produced interesting and illuminating results. If they would be of any value to you, we will be glad to forward copies of our laboratory reports covering the work done on Hansa yellow.

Very truly yours,

NETHERCUTT LABORATORIES,
By J. B. NETHERCUTT.

Mr. KLEINFELD. Because there is no way of checking whether or not you wrote that letter and whether or not the Food and Drug Administration replied unless you know the date.

Mr. NETHERCUTT. No.

Mr. KLEINFELD. Are you sure they received the letter?

Mr. NETHERCUTT. No.

Mr. KLEINFELD. Did you ever write them again?

Mr. NETHERCUTT. No.

Mr. KLEINFELD. How long ago did that happen?

Mr. NETHERCUTT. 1938.

Mr. KLEINFELD. Thirteen years ago?

Mr. NETHERCUTT. Yes.

Mr. KLEINFELD. And you have not written them since?

Mr. NETHERCUTT. No.

Mr. KLEINFELD. Do you know that the Food and Drug Administration has a local office here?

Mr. NETHERCUTT. Yes.

Mr. KLEINFELD. Did you ever contact them?

Mr. NETHERCUTT. No.

Mr. KLEINFELD. In 13 years?

Mr. NETHERCUTT. No.

Mr. KLEINFELD. Did you ever ask them about that letter?

Mr. NETHERCUTT. I have had no reason to.

Mr. KLEINFELD. You believe that the Food and Drug Administration doesn't enforce the law because it doesn't tell cosmetic manufacturers which ingredients are harmless, but you don't believe that the cosmetic manufacturers should ask whether or not their products are harmless; is that correct?

Mr. NETHERCUTT. No, I didn't say that.

Mr. KLEINFELD. What did you say?

Mr. NETHERCUTT. I said the Food and Drug Administration has never, to my knowledge, told any cosmetic manufacturer what materials they have deemed to be deleterious.

Mr. KLEINFELD. But you don't know whether any cosmetic manufacturer has asked Food and Drug whether its materials are deleteritous; is that correct?

Mr. NETHERCUTT. I have no knowledge.

Mr. KLEINFELD. You don't know either way?

Mr. NETHERCUTT. That is correct.

Mr. KLEINFELD. And it is upon that basis that you make the statement that the laws are not being properly enforced?

Mr. NETHERCUTT. Yes.

Mr. KLEINFELD. All right.

Let me read you something which the Food and Drug Administration has reported to this committee.

About 8 or 9 years ago the styles in hair arrangement for women resulted in a widespread adoption of what has been facetiously called the "washerwoman hairdo," which involved piling the hair on top of the head and arranging it neatly so that it would remain in such arrangement for an indefinite period. Among the esthetic draw-backs to this hair arrangement were the stray locks on the back of the neck which did not conform to the arrangement and were left dangling in a more or less untidy effect. To meet the crying need thus created, an immediate popularity developed for some kind of adhesive material which would affix these stray locks in an upward direction and attach them to the remainder of the upswept hair. To fill this need, a Chicago manufacturer created "Locks-Up Hair Lacquer Pads." These were in the form of a cotton pad impregnated with a lacquer substance which, when brushed upward around the hair-do, increased the tidiness of the arrangement by gluing the hair to the rest of the arrangement. In applying the lacquer pads they necessarily came in contact with the skin and scalp adjacent to the hair.

This development occurred during wartime when there was a scarcity of lacquer materials, shellac, varnish, resins, and glue. Apparently the first product was entirely successful and created an enormous demand. Subsequent batches of manufacture employed unknown and untested adhesive materials, synthetic resins, et cetera, and the result of that hasty improvising was that hundreds of women throughout the United States suffered significant injury by reason of the poisonous nature of the resins used, which created a contact dermatitis and other painful and disfiguring complications. As a result of regulatory activity of this Administration, the product was eventually removed from the market, but not until a great deal of damage had occurred.

How do you think better enforcement such as you have referred to would have prevented these injuries?

Mr. NETHERCUTT. In the first place, I don't know what is meant by a great deal of damage. How many women were involved?

Mr. KLEINFELD. Let's say six.

Mr. NETHERCUTT. Six?

Mr. KLEINFELD. Yes. For the sake of argument only let's assume that just six women were hurt.

Mr. NETHERCUTT. There evidently was a deleterious substance in that cosmetic. The manufacturer was responsible, and there are courses by which his customers could have recourse to him if he damaged them. Once the ingredient or the cosmetic was deemed to be deleterious, the Food and Drug Administration could seize it and stop its use. I believe that the controls were adequate in that case.

Mr. KLEINFELD. The facts are that the Food and Drug Administration did stop the use of this product and did prosecute successfully the manufacturer, but these women were nevertheless injured, were they not?

Mr. NETHERCUTT. Evidently so. I have no knowledge of it.

Mr. KLEINFELD. Well, vigorous enforcement of the present law did not help them particularly, did it?

Mr. NETHERCUTT. Evidently not.

Mr. KLEINFELD. I have no further questions.

Dr. HEDRICK. Any further questions?

Mr. JONES. No.

Dr. HEDRICK. Do you make a cream containing estrogenic hormone?

Mr. NETHERCUTT. No.

Dr. HEDRICK. That is all. Thank you.

Mr. NETHERCUTT. Thank you.

Dr. HEDRICK. Who is the next witness?

Mr. KLEINFELD. Mr. Borkman.

(The oath was administered by the chairman.)

TESTIMONY OF LYMAN BORKMAN, REPRESENTING THE COLONIAL DAMES CO., LTD., HOLLYWOOD, CALIF.

Mr. KLEINFELD. Mr. Borkman, what position do you hold with the Colonial Dames Co.?

Mr. BORKMAN. I am in charge of manufacturing and testing.

Mr. KLEINFELD. What is your academic background?

Mr. BORKMAN. I have high-school chemistry, and I have taken numerous special courses, a couple of the cosmetic courses conducted here in Los Angeles years ago, and other chemistry courses, night-school courses.

Mr. KLEINFELD. You have no degree?

Mr. BORKMAN. No degree.

Mr. KLEINFELD. Where did you take these courses?

Mr. BORKMAN. I took a course at Hollywood, at Fairfax, one conducted at City College and Poly.

Mr. KLEINFELD. Read your statement, please.

Mr. BORKMAN. We submit herewith a list of the various ingredients used in the cosmetic and toilet goods preparations manufactured by our company. We manufacture colognes, perfumes, bath bubbles,

make-up, creams, lotions, face powder, and dusting powder. All colors used in the manufacture of our products are certified food or certified D and C colors.

The first step in our system of controls is in the purchase of materials. In all purchases where it is possible we obtain raw materials and ingredients that meet or exceed USP standards and conform with the Food and Drug Administration regulations. We run tests on materials as to purity or other chemical standards for uniformity, and, furthermore, we purchase such raw materials and chemicals that have been in use for a number of years in finished products similar to our own.

Most of our products, that is, creams and lotions, are made from bland materials such as lanolin, lanolin derivatives, oils, waxes, honey, and almond meal. We test our finished products in a number of different ways, namely as to the stability of the product on aging or shelf-life, heat and cold, for physical or chemical changes, and the usual pH tests. We patch test our creams, lotions, and other products.

The owners of our company have been engaged in the manufacture of cosmetic and toilet goods preparations as far back as 1886, and with few exceptions such as lipsticks and other strictly make-up items, have produced during these years mainly creams and lotions based on original formulas.

We believe we are fully protected and the health and welfare of the Nation is likewise fully protected by the standards set up by the Federal Food and Drug Administration governing raw materials used in the production of our products.

List of materials: (The list referred to is in the committee files).

Dr. HEDRICK. Do you carry insurance to protect your operation?

Mr. BORKMAN. Yes, we do.

Dr. HEDRICK. How many suits have you had since you have been in business?

Mr. BORKMAN. Oh, I have been with the firm for 28 years, and I don't recall over possibly four. Not really suits. Every one of them have been settled.

Dr. HEDRICK. Settled out of court, were they?

Mr. BORKMAN. I think so. Small suits.

Dr. HEDRICK. In other words, the insurance company settled the claim to the satisfaction of the customer?

Mr. BORKMAN. No, I wouldn't say that. I couldn't answer that. I am not in the legal department of our firm and would rather not answer that. I am not certain what happened—whether we settled with them ourselves or whether the insurance company settled with them, or what was involved in the claim.

Dr. HEDRICK. Do you have any questions, Mr. Jones?

Mr. JONES. Does your company maintain its own laboratory for testing?

Mr. BORKMAN. Yes, we do.

Mr. JONES. You do?

Mr. BORKMAN. We do.

Mr. JONES. Do you test all the materials that go into your product?

Mr. BORKMAN. We test anything that we feel has any possibility of any danger connected with it. In other words, we don't test each batch of lanolin or such bland items. But things such as titanium

dioxide, comes in with certification as to the purity of it. In addition, we do our own test on any materials we feel necessary to test.

Mr. JONES. I have no more questions, Mr. Chairman.

Dr. HEDRICK. Mr. Kleinfeld, do you have any questions?

Mr. KLEINFELD. Yes.

Is the list of materials which you submitted to this committee a complete list?

Mr. BORKMAN. I think so, to the best of my knowledge.

Mr. KLEINFELD. Can you state what products you sell?

Mr. BORKMAN. Well, creams, lotions, perfumes, colognes, deodorants, powders, dusting powders, lipstick—well——.

Mr. KLEINFELD. Shampoo?

Mr. BORKMAN. No, we do not make shampoos.

Mr. KLEINFELD. How many employees do you have?

Mr. BORKMAN. I would say approximately 50. In busy times, probably 75.

Mr. KLEINFELD. How many employees in your testing laboratory?

Mr. BORKMAN. Well, we have about three in our laboratory. That is, in our testing laboratory; more in the manufacturing laboratory, of course.

Mr. KLEINFELD. What are their qualifications?

Mr. BORKMAN. They have no degrees.

Mr. KLEINFELD. No degrees?

Mr. BORKMAN. No.

Mr. KLEINFELD. You do all your own testing?

Mr. BORKMAN. Yes, we do. There are occasions, I might say, we have a Dr. York as a consultant that we bring in if we have any special problems or anything that we want cooperation on.

Mr. KLEINFELD. But ordinarily speaking, your own people do your testing?

Mr. BORKMAN. That is right.

Mr. KLEINFELD. Do you use natural estrogenic hormones in your product?

Mr. BORKMAN. Yes, we do.

Mr. KLEINFELD. Do you know what the cationic wetting agents are?

Mr. BORKMAN. Well, there are anionic and cationic, and also nonionic wetting agents. Most of our wetting agents are nonionic. I have had very little occasion to have anything to do with cationic.

Mr. KLEINFELD. Your wetting agents are what kind?

Mr. BORKMAN. Nonionic, as a rule.

Mr. KLEINFELD. In what products do you use them?

Mr. BORKMAN. We use the nonionic in a make-up, a cream make-up that we manufacture. Because of the pigments added, the cream would break down if we used any other type of emulsifier.

Mr. KLEINFELD. What function does the wetting agent serve in that product?

Mr. BORKMAN. Are you referring to my list of wetting agents?

Mr. KLEINFELD. Your list specifies wetting agents.

Mr. BORKMAN. They are all used in bubble-bath, that particular wetting agent.

Mr. KLEINFELD. Any other?

Mr. BORKMAN. I refer to the other so-called wetting agents as emulsifiers used in the make-up.

Mr. KLEINFELD. I am a little confused. You use wetting agents in what products? Just bubble-bath?

Mr. BORKMAN. Just bubble-bath.

Mr. KLEINFELD. Nothing else?

Mr. BORKMAN. Nothing else.

Mr. KLEINFELD. Do you make tests on the eyes of animals with those wetting agents?

Mr. BORKMAN. No, we do not. We patch-test them. Of course, you realize this: that in the package of bubble-bath there are three-quarters of an ounce, of that—60 percent water softening agents and 40 percent active wetting agents. So you can imagine the minute quantity. I have washed my eyes in it many times; my whole family does, my baby does.

Mr. KLEINFELD. How do they feel?

Mr. BORKMAN. Fine. It is better than soap.

Mr. KLEINFELD. Have any of your products been submitted to the committee on cosmetics of the American Medical Association for acceptance or approval?

Mr. BORKMAN. Never that I know of.

Mr. KLEINFELD. You say in the last paragraph of your statement:

> We believe we are fully protected and the health and welfare of the Nation is likewise fully protected by the standards set up by the Federal Food and Drug Administration governing raw materials used in the production of our products.

What do you mean by that—what standards?

Mr. BORKMAN. Well, would you repeat that again, please?

Mr. KLEINFELD. Will you please read the last sentence of your statement here? You refer to standards.

Mr. BORKMAN (reading):

> We believe we are fully protected and the health and welfare of the Nation is likewise fully protected by the standards set up——

Mr. KLEINFELD. You refer to standards there.

Mr. BORKMAN. Yes.

Mr. KLEINFELD. I wondered what standards you were referring to.

Mr. BORKMAN. I am referring to the Food and Drug regulations as to the deleterious materials.

Mr. KLEINFELD. I am not familiar with any such regulations. I am just wondering where you find them. The law says, of course, that if a manufacturer puts out a material which contains a deleterious ingredient, he may be prosecuted for it.

Mr. BORKMAN. That is true.

Mr. KLEINFELD. Is that what you mean?

Mr. BORKMAN. Yes.

Mr. KLEINFELD. You don't mean any standard list?

Mr. BORKMAN. No. I am sorry.

Mr. KLEINFELD. I would like your opinion on the case I mentioned before. A manufacturer puts out a dry shampoo and in it he uses a wetting agent of some kind or other, and a quaternary compound, and one or the other, or the combination, causes fairly serious eye damage to the person using the shampoo. How do you think that existing law protects these women?

Mr. BORKMAN. Well, when I made that statement I had in mind the thought that cosmetics are used on the skin and on the surface.

And to me it threw it in an entirely different category of foods or drugs that I interpreted would be taken internally. To me the danger was much greater. But if I should hear many more of the type cases that you say, it would be possible I would change my mind. Right now I am very much undecided about it.

Mr. KLEINFELD. I see. Could you describe to this committee generally what tests you make from the time you get your raw material to the time you dispense and sell your finished product?

Mr. BORKMAN. As the materials come in we identify the materials and make certain the material is what we have purchased—lanolin is lanolin, titanium dioxide is titanium dioxide, and so forth. We run chemical tests to prove this. We also run any other tests as to purity at the time, or standards of the materials that we think it is necessary to do so. Through many, many years of use, of course, we run standards to assure ourselves of the acid number of beeswax and know each batch is going to be uniform. Simply our own needs.

As far as running tests on lanolin we bring in, or beeswax or other type waxes or oils that we buy—we buy USP and we rely on some of those from the manufacturer.

Mr. KLEINFELD. Do you do patch-testing yourselves?

Mr. BORKMAN. Yes, we do.

Mr. KLEINFELD. How many subjects do you use?

Mr. BORKMAN. We get whom we can. I just happened to pick up the last one, which was run on 14 subjects.

Mr. KLEINFELD. Fourteen?

Mr. BORKMAN. Fourteen, yes.

Mr. KLEINFELD. Do you think that is enough?

Mr. BORKMAN. Well, it is all that we have available, because of the fact that we do it ourselves. We have some 25 girls. It is a little difficult to get them all to take the test. We can usually get 10 or 15, or sometimes 20.

Mr. KLEINFELD. No further questions.

Dr. HEDRICK. Any other questions?

Mr. JONES. No.

Dr. HEDRICK. Thank you very much for coming before the committee, Mr. Borkman.

Mr. BORKMAN. Thank you.

Dr. HEDRICK. Who is the next witness?

Mr. KLEINFELD. Mr. Brinkerhoff.

(The oath was administered by the chairman.)

TESTIMONY OF J. M. BRINKERHOFF, REPRESENTING STUDIO GIRL HOLLYWOOD, INC., GLENDALE, CALIF.

Mr. KLEINFELD. Mr. Brinkerhoff, what position do you hold with the Taylor-Rea Corp.?

Mr. BRINKERHOFF. The Taylor-Rea Corp. has been changed. The corporate name now is Studio Girl Hollywood, Inc., 3618 San Fernando Road. That particular designation is out of date.

The position I hold at the present time is assistant to the president. You are probably interested in my responsibilities?

Mr. KLEINFELD. Yes.

Mr. BRINKERHOFF. I deal with the production of all cosmetics and all shipping, my functions deal primarily with the plant.

Mr. KLEINFELD. You are not a technical man, are you?

Mr. BRINKERHOFF. I am not a graduate chemist. I am a college graduate with a minor in chemistry, 18 hours of chemistry in college.

Mr. KLEINFELD. Please read your statement.

Mr. BRINKERHOFF. We have made it a practice through the years to purchase our materials only from the most reputable suppliers and the finest of perfume and color houses in America. Our goal has always been to compound and market products of the finest quality which have been carefully controlled and tested. When the various ingredients reach us, we make an inspection to see that the packages are still factory sealed and that they do represent the items that we have ordered.

We have another very important testing method for our products. We have submitted them to the Parent's magazine, Good Housekeeping magazine, and the committee on cosmetics of the American Medical Association. These organizations conduct a thorough test on our products before granting their seals of approval on them. You are undoubtedly familiar with the testing methods used by them.

We have time-proven products which have been marketed through the years. These products have been accepted by the public. Whenever we change one of our formulas, we circulate the new or changed product through the 50 or 60 office and factory employees that we have in our home organization. These people are in daily contact with our products, and many of them purchase the products for their own use. They are constant users and constant critics. They give us worthwhile comments concerning the products with regularity.

In addition, we shelf-test many of our products over a considerable length of time before distributing them commercially. On some products, such as our cream shampoo, we employ the services of a consulting chemist who is a specialist in detergents. Upon occasion, we have used other consulting chemists on any problems that have arisen. Each batch of each compound is checked, and double checked, for correct weight and type of ingredient. A permanent record is maintained on each batch from start to packaged product. Lot numbers are kept on each shipment of ingredients received.

Ingredients: (The list of ingredients referred to is in the files of the committee).

Dr. HEDRICK. Do you have any question, Mr. Jones?

Mr. JONES. I do not have any questions; no.

Dr. HEDRICK. All right, Mr. Kleinfeld.

Mr. KLEINFELD. Mr. Brinkerhoff, is the list of materials which you furnished to the committee, together with the supplemental list, all the materials which you use in your products?

Mr. BRINKERHOFF. That is the list of all the ingredients we use in our manufacturing.

Mr. KLEINFELD. What products do you make?

Mr. BRINKERHOFF. We make a line of face creams, cleansing cream, day cream, night cream, masks, orchid lotion. We make in addition to that our colognes, and we purchase other products from other companies for resale. They come to us as finished products. We make some men's products—after-shave lotion and men's cologne.

Mr. KLEINFELD. Approximately how many products do you make?

Mr. BRINKERHOFF. I would say about 25. Of course, each product has many sizes.

Mr. KLEINFELD. You say you have submitted your products to the committee on cosmetics of the American Medical Association?

Mr. BRINKERHOFF. Yes.

Mr. KLEINFELD. All your products?

Mr. BRINKERHOFF. Not all of them; no, sir.

Mr. KLEINFELD. About how many?

Mr. BRINKERHOFF. We submitted all the products that constitute our biggest selling item, which is this [indicating].

Mr. KLEINFELD. About how many of the 25 would you say?

Mr. BRINKERHOFF. I would say about three-quarters of them.

Mr. KLEINFELD. And how about the balance, why didn't you submit them?

Mr. BRINKERHOFF. We felt that it was not required. This is a long and tedious process. We wanted to get the approval of these particular products first before we went into the procedure that is involved for all the rest.

Mr. KLEINFELD. What criteria did you use in deciding which ones to submit for approval and which ones not to submit?

Mr. BRINKERHOFF. Well, naturally, we were interested in getting this approval on the items that offer the greatest sales value to us.

Mr. KLEINFELD. Wouldn't it be a good idea to submit all of them?

Mr. BRINKERHOFF. Yes, it would, and we intend to.

Mr. KLEINFELD. Have any of your products not been accepted by the American Medical Association?

Mr. BRINKERHOFF. No, sir; they haven't. They have asked us to qualify several of the labels on the products, but the products themselves have been approved.

Mr. KLEINFELD. Are you familiar generally with the standards which that committee on cosmetics has set up before it will accept a cosmetic?

Mr. BRINKERHOFF. They gave us literature and described to us the standards that they felt were necessary.

Mr. KLEINFELD. And you have attempted to comply with those standards?

Mr. BRINKERHOFF. Yes; we have.

Mr. KLEINFELD. Have you found it possible to comply with them?

Mr. BRINKERHOFF. Yes; we have. We have received their approval.

Mr. KLEINFELD. Have you found it very difficult, or impossible, to comply with the standards they have established?

Mr. BRINKERHOFF. No; we have not.

Mr. KLEINFELD. About how many people do you employ in your organization?

Mr. BRINKERHOFF. We employ about 60 people in our plant and office.

Mr. KLEINFELD. Did you say you have your own testing laboratory?

Mr. BRINKERHOFF. No, sir; we do not.

Mr. KLEINFELD. Who does your testing for you?

Mr. BRINKERHOFF. We have followed this procedure, which we feel is the most suitable for our particular organization. We are in a little different situation than the other companies that have testified in that we have used the services of consultants in the formulaion of our products.

I will mention a few of those consultants. Dr. Henry Miller, cosmetic chemist in Los Angeles; Dr. Morris Katzman, a chemical con-

sultant on detergents. In addition to this, the firms that manufacture our other products, complete and shipped to us for resale, are adequately staffed for the formulation of products that we desire.

Mr. KLEINFELD. Do you change the formulas of your products from time to time?

Mr. BRINKERHOFF. We have. The times have been very few and far between. Our business is such that we present the same set of cosmetics to all of our customers. And in presenting this set it has a fixed make-up, and the items themselves have all been in existence in our line now for a period of many years.

So we use the services of these consultants just as you might use the services of a physician in getting a prescription. We tell the consultant the type of product that we want, realizing that he is an expert. We are not of a size to warrant hiring a person like that on a full-time basis. He compounds the product for us, or formulates it for us—supplies to us a formula. We then take this formula and make a test batch of it under this person's supervision. We see that it compares with the originally formulated material as he formulated it. After we have done that we use the product or have it used by the people who work in our own organization. Then we get their opinions on it as far as any deleterious effects, whether they approve of it in substance. After they approve the product, then we are ready to place it in commercial production.

Mr. KLEINFELD. You say in your statement that when you change one of your formulas you circulate the new product or changed product throughout your organization.

Mr. BRINKERHOFF. Yes; we do.

Mr. KLEINFELD. About how many people would you think actually use the changed formula?

Mr. BRINKERHOFF. I would say between 25 and 50.

Mr. KLEINFELD. Do you have patch tests made with the new formula?

Mr. BRINKERHOFF. We do not have them made.

Mr. KLEINFELD. Does anybody do it for you?

Mr. BRINKERHOFF. On the products that are made outside of our own particular plant, that come to us packaged for resale, those tests are made.

Mr. KLEINFELD. But not on your own products?

Mr. BRINKERHOFF. On the products that we sell that we do not compound ourselves, they are made. The ones that we manufacture within our organization have all been in existence for many, many years. In the last 6 years we have sold 10 million packages of our products.

Mr. KLEINFELD. But have you not changed the formulas from time to time of the products which you yourself make?

Mr. BRINKERHOFF. Very slight changes; yes, sir.

Mr. KLEINFELD. These 14 products which you mention on the back of this Studio Girl advertisement——

Mr. BRINKERHOFF. Yes.

Mr. KLEINFELD (continuing). Have these all been submitted to the committee on cosmetics?

Mr. BRINKERHOFF. Yes, they have. There are two products there that we have not received the approval on as yet. They are still being investigated. They are the face powder and the beauty mask. Our

supplier of those items failed to get his information in in time, and the AMA only have a committee meeting at regular intervals. All the other products have been approved by the committee on cosmetics.

Mr. KLEINFELD. As far as your organization, at least, is concerned, you believe in pretty careful testing of the ingredients of your products before they are sold; do you not?

Mr. BRINKERHOFF. We feel that probably the most important test is the test of the consumer, one of the most important tests, after we have sought competent advice. And we have been protected by liability insurance by Lloyds of London for the last 6 years and have had no claims during that time.

Mr. KLEINFELD. You have been present here this morning?

Mr. BRINKERHOFF. Yes, I have.

Mr. KLEINFELD. And yesterday?

Mr. BRINKERHOFF. Yes, sir.

Mr. KLEINFELD. You heard me mention some cases that have occurred during the fairly recent past, of injuries caused by cosmetics. What do you think we ought to do to avoid that sort of thing?

Mr. BRINKERHOFF. Well, I can't speak for the other companies, but I feel that our record would speak for itself, more or less, that we feel the methods we have employed for our size of company have been satisfactory. Ten million units have been sold in the last 6 years, and no claims of any sort.

Mr. KLEINFELD. I wasn't addressing myself to you personally, sir. I mean as a general proposition, considering the public as a whole and considering other cosmetic manufacturers—I assume there are many of them, big and small?

Mr. BRINKERHOFF. Yes.

Mr. KLEINFELD. In trying to protect the public as best we can to avoid the kind of injury which I have described, do you think it would be well to have results of tests made on new materials and new products submitted to some agency or advisory body for approval before they are used, just as you submit your products to the AMA?

Mr. BRINKERHOFF. Well, we felt that that was the advisable procedure.

Mr. KLEINFELD. Do you still feel that way?

Mr. BRINKERHOFF. Yes. We think it substantiates the work of the consultant, our own tests with our own individuals. We have this impartial body that also tests them and we thought it was a good idea; consequently we went ahead with it.

Mr. JONES. Do I understand from your testimony that you buy some products that are compounded by other manufacturers and you merely supply the label and act as the distributing agent for it?

Mr. BRINKERHOFF. Yes, sir.

Mr. JONES. What percentage of your business is made up of those products that are compounded by other firms?

Mr. BRINKERHOFF. I would say probably between 30 and 40 percent.

Mr. JONES. Would you as a manufacturer or distributor have any objection to including on the label the ingredients that enter into that product?

Mr. BRINKERHOFF. We wouldn't have any objection, except from the standpoint that in cosmetics we are conscious of the fact that beauty is one of the ingredients in the package of cosmetics. I think a long list of ingredients would detract from the salability of the product.

From the standpoint of disclosing what is in the products, we would have no objection whatsoever, because we feel that the same things we use are used by other companies in the United States.

Mr. JONES. Yes.

Mr. BRINKERHOFF. It is no trade secret that most cosmetics are very similar.

Mr. JONES. Of course, we all recognize that one manufacturer can buy another's product at the counter and test it, and find out what the other fellow has, and it is merely a matter of opinion as to which does the best job and which makes the most attractive package, has the best advertising and sales force to put it over.

Mr. BRINKERHOFF. Yes.

Mr. JONES. I still think if you would put the ingredients on the label, the customer would have some protection so that if she has found from experience that she is allergic to a certain ingredient in face cream or cold cream, she could look on the package and avoid that particular one.

Mr. BRINKERHOFF. It would be a very lengthy list. In some of our products we have as high as 20 different items. To give you a specific example, one perfume oil used in one product might have 30 ingredients in the perfume itself. So you would wind up with nothing but ingredients.

Mr. JONES. I have no more questions.

Mr. KLEINFELD. I have no more questions.

Dr. HEDRICK. We thank you very much, Mr. Brinkerhoff.

Mr. KLEINFELD. Is Mr. Noble here?

Mr. BIERLY. No. I am appearing for him. My name is Sidney H. Bierly, executive secretary and manager.

(The oath was administered by the chairman.)

TESTIMONY OF SIDNEY H. BIERLY, EXECUTIVE SECRETARY AND MANAGER, CALIFORNIA FERTILIZER ASSOCIATION, LOS ANGELES, CALIF.

Mr. KLEINFELD. What is your full name, sir?

Mr. BIERLY. Sidney H. Bierly.

Mr. KLEINFELD. What position do you hold with the California Fertilizer Association?

Mr. BIERLY. I am the executive secretary and manager.

Mr. KLEINFELD. And you are here to read the statement of that association?

Mr. BIERLY. Yes, sir.

Mr. KLEINFELD. Proceed, please.

Mr. BIERLY. I might say that I have with me Dr. Wallace Macfarlane, who is a Ph. D. in agricultural chemistry and agronomy, who is here to answer any technical questions which you might have in connection with the use of fertilizer materials in California. I am not qualified, frankly. My background has been in public relations and in organizational management.

Mr. JONES. What is the position of the other gentleman?

Mr. BIERLY. Dr. Macfarlane is vice president of the Pacific Guano Co. and a past president of the California Fertilizer Association.

Mr. JONES. How many members are in the California Fertilizer Association, approximately?

Mr. BIERLY. We have approximately 165 members, including associate members. We classify primary producers as associate members, and mixers and distributors as active members; total of 165.

Mr. JONES. That includes the majority of the manufacturers and distributors of fertilizer, would you say?

Mr. BIERLY. Yes, sir.

We appreciate very much the fact that this committee of Congress has come to California to hear testimony on the results of the use of chemicals in the production of California's crops, and that we are being accorded the privilege of presenting data on the subject. California is a very important source of food and fiber. Our farmers produce nearly 250 separate crops on a commercial scale in addition to livestock, dairy products, poultry, and eggs.

The total cash farm income for 1949 was $2,066,431,000, according to the preliminary figures of the Bureau of Agricultural Economics, United States Department of Agriculture. This food and fiber was a very important factor in feeding and clothing our own people within the United States and in alleviation of the suffering of countless men, women, and children in the other countries of the world where we have accepted the responsibility of helping to restore self-respect and the will to carry on in a free community of nations. Let me say here that the production of that volume of food and fiber of the highest possible quality would have been impossible on the land available had its producing farmers used no commercial or chemical fertilizers. The United States Department of Agriculture estimates that at least 25 percent of the volume of America's agricultural production is due to the use of chemical fertilizer materials. At the same time, nutritional quality and appearance is noticeably improved.

There has been a great deal of irresponsible talk about the danger of using chemical fertilizer on the soil. Cultists who subscribe to the so-called organic school of thought have made many damaging statements, entirely devoid of any scientific foundation, designed to convert the public to their philosophy of crop production. They have said, for example, that chemical fertilizers will damage and kill the micro-organisms of the soil. We could quote dozens of scientific authorities who have studied carefully the reactions of these micro-organisms to these materials, to the effect that they are not damaged or injured in any way. Another untruth being spread by these people is the story that chemical fertilizers damage the health of plant, animal, and human life. The testimony of dozens of authoritative soil and plant scientists refute this and similar untruths. Dr. William A. Albrecht of the University of Missouri brought this out adequately in his letter to Chairman Delaney, which is a part of your committee record.

There is absolutely no difference in the nitrogen, phosphoric acid, and potash which is of necessity assimilated by all plant life, whether it originates in chemical fertilizer materials or in natural organic material. The soil organisms must transform all plant food elements except nitrate into nitrogen before they can become available for plant life, and that process makes the different types of each element into identical forms.

Dr. Emil Truog, professor of soils, University of Wisconsin, in a prepared statement filed with this committee and incorporated in your record of hearings on pages 463, 464, and 465, points out that there is

no authentic evidence that proper use of commercial fertilizer causes injury to soil or its components; but that, in fact, an improvement usually follows. He pointed out, too, that the chemical elements of natural organic materials and of chemical fertilizer materials are transformed so that they are identical before they are absorbed by plant life. This is a slow process as the organic nitrogen must be transformed into nitrate nitrogen and the phosphorus and sulfur into phosphoric and sulfuric acids, respectively, by the natural action of soil micro-organisms, to make them available for plant assimilation.

We have no quarrel with the use of natural organic fertilizers. In fact, our industry often uses these materials in many of its mixtures as well as in their simple form. They have a definite and vital place in soil-fertility management, but they do not go nearly far enough in replacing the nutritional elements which growing plants remove from the soil, and must be supplemented by chemical materials. The only alternative is eventual depletion of all plant foods, which means loss of soil fertility. Dr. Albrecht, in his statement to this committee, is an authority which I quote—

> on most of the soils the plants grown without fertilizer additions to supplement the soil's stock of plant nourishment are of such poor quality as to give poor health and deficiency diseases.

It is reasonable to point out that even if exclusive use of natural organic materials seemed desirable, there just would not be enough to take care of our present-day fertilizer requirements.

We have adequate official data on the benefits to be derived from sound fertilization practices on California soils and crops. Captain Sutter, a Swiss, who settled in the Sacramento Valley in 1840, and Captain Weber, a German, who settled in what is now the Stockton area, in 1843, General Bidwell, Butte County, and a few others, were quick to see the agricultural possibilities of central California.

Later, during the height of the gold rush in the 1850's, there were a number of gold seekers with agricultural background in other parts of the world who, with Sutter and Weber, were the real fathers of the present-day agriculture in this State. The earlier mission fathers who instituted a limited program of agriculture to sustain those who lived in and around the missions, but whose principal contribution was in the field of viticulture, were important in our agricultural development, and their mark is indelibly left on our memories because of the many romantic stories that have been told of their trail-blazing work.

However, it was the early immigrant settler and the transplanted agriculturist who was drawn to this new country by the promise of gold to be found at the stroke of the pick, who was the real agricultural pioneer. He found unbelievable soil fertility in contrast to the worn-out and depleted soils with which he had previously contended. Records indicate that early yields were very high.

I am indebted to Dr. Hans Jenny, professor of soil chemistry, University of California College of Agriculture, for the following statement:

> "Vegetables raised here would astonish you both as to quantity and quality; cabbages, 53 pounds per head; Irish potatoes 33 inches in circumference," etc., wrote George McKinstry, Jr., to Lieutenant Kern in 1851. J. B. Crockett, in a lecture in San Francisco in 1854, exclaimed: "In spite of droughts and floods

and winds and fogs, the virgin soil yielded such bounteous returns as had hitherto been wholly unknown in any part of the world, and were in fact so marvelous as to challenge belief in their reality." Wheat yields were 40 to 50 and even 70 bushels per acre. (At present 25 to 30 bushels is considered exceptionally good.) Nevertheless, California signified no exception to the general principle that cultivated soils sooner or later decline in their productive capacity unless corrective measures are applied.

General farmer recognition that chemical fertilizers must be used to restore and maintain soil fertility is reflected in the fact that their use in California has increased from 9,073 tons in 1904 to 639,607 tons in 1950. These are the official figures of the California State Bureau of Chemistry. The trend continues steadily upward, and soil scientists agree that far more chemical fertilizer should be used in California to maintain fertility. This is especially important now because of the pressing need for more quality food and fiber necessary to sustain the civilized world. Increased use of fertilizers in future years is vital, regardless of world conditions, because of the tremendous and continuing population growth of California and the other Western States that must be fed and clothed through our own resources.

This brings us to the question as to the effect which chemical elements in our commercial fertilizers have on soil, its micro-organisms, plant and animal life.

Our California State law (sec. 1022 of the Agricultural Code of California) defines commercial fertilizers as substances and mixtures of substances containing 5 percent or more of nitrogen, available phosphorus pentoxide, or potassium oxide soluble in distilled water, singly, collectively or in combination, except manures, hays, straws, peat, and leaf mold. Manures are classed separately for the purpose of controlling sales. The manufacture and sale of commercial fertilizers is very capably regulated by the Bureau of Chemistry, State Department of Agriculture, its authority having been established in the code. Among the covering regulations are:

(1) Each lot or parcel of commercial fertilizer offered for sale must bear a label with the following information: Name or brand name of product; name and address of the producer, importer, or dealer; place of manufacture; chemical analysis.

(2) Every producer, manufacturer, or importer must obtain a certificate authorizing the registrant to sell commercial fertilizers.

(3) The State Bureau of Chemistry is authorized to take samples and make tests to determine if the commercial fertilizer conforms to the guaranty. (Samples are taken at frequent intervals and the results of the tests are made public. In the event of too frequent recurring deficiencies, the bureau takes action, resulting in varying degrees of penalties being assessed. It has authority to revoke or suspend licenses if this action seems warranted. Such action is seldom necessary, however.)

(4) A tonnage tax on sales, and registration fees are authorized.

The public interest is adequately served in the administration of those portions of the State agricultural code which have to do with commercial fertilizers.

Dr. HEDRICK. I was under the impression that the soil here in California was very fertile, that all you needed was water. That is what they tell us in Washington. [Laughter.]

Do you need fertilizer here in California?

Mr. BIERLY. This next part is very interesting in connection with what you have brought up. With reference to the maintenance of proper balance of plant foods in California soils Dr. Jenny, who has been referred to above, has made some excellent observations that are published in Bulletin 155 of the State division of mines, Minerals Useful to California Agriculture, and I quote him:

The university strongly encourages the application of fertilizers for California soils. It places emphasis on research for rational use in accordance with the needs of the plant and of the soil.

The establishment of a sound and economical fertilizer program is an individual farm problem in which crop, soil type, climate, previous cropping, and soil-management practices are the important factors. Obviously it is impossible to maintain a scientifically controlled experiment field on every part of every farm in the State. Hence the university has long engaged in an intensive study of the scientific principles which underlie crop production, though without losing intimate contact with the needs of the practical farmer.

In virgin soils there exists a delicate balance between gains of nitrogen through bacterial activity and losses through the decomposition of organic materials. When man removes the natural plant cover and cultivates and crops the land, this equilibrium is disturbed and nitrogen losses are increased.

Just when the need for replenishing nitrogen was first felt in California, it is difficult to say. No records are on hand that would indicate any directed use of animal manure in the agriculture of the mission period. Old settlers maintained that "manuring is too costly and will never pay." When Hilgard came, in 1875, he was fully conscious of the possibilities of nitrogen deficiencies. He initiated field experiments, some pot tests with sodium nitrate, and numerous chemical soil analyses, in attempts to explore the nitrogen problem. He concluded, however, that in California soils nitrogen would probably not be among the first ingredients to be exhausted. "So far as our observations go," he wrote, "it is likely to become deficient next in order to phosphoric acid under normal conditions and should be supplied whenever the superphosphates fail to produce satisfactory results." Now, half a century later, nitrogen is considered to be the first limiting element for most California soils.

On the Aiken clay loam, characteristically low in available phosphorus and having a high fixing power for this element, the yield of cherries, prunes, almonds, peaches, walnuts, and apples is very good; and furthermore, heavy applications of phosphates have not, so far, produced any changes in yield, quality of fruit, or tree growth. On this same soil and in the same locality (Paradise), 18 field and truck crops, such as corn, beans, alfalfa, lettuce, and barley, failed to make satisfactory growth unless large amounts of phosphate were added. For example, in 1940, the yield of potatoes, when no phosphate was added, was 4 tons per acre. Nitrogen alone gave little or no increase. When phosphate alone was added (2,200 pounds of P_2O_5 per acre), the yield rose to 12 tons. Phosphate in combination with nitrogen produced 17 tons.

The exact reason for the differential behavior of trees and annual crops is not fully understood. On an acre basis, the phosphate removal by an average crop of oranges plus that required for the production of the annual new growth of the trees is not greatly different from that removed by small grain, corn, clover, and potatoes. But whereas the annual crops must obtain their phosphates in a growing period of from 2 to 4 months, citrus trees probably absorb phosphate continuously throughout the year. Similarly, the root activity of deciduous fruit trees under California conditions appears to continue throughout the winter.

With soil types that are not as deficient in available phosphorous as the Aiken clay loam, the responses to field crops vary greatly. Field experiments (1937–40) with Ladino clover, a legume, on San Joaquin loam near Oakdale showed an average yield of dry matter amounting to 1.61 tons per acre. Treble superphosphate at the rate of 69 pounds of P_2O_5 per acre produced an increase of 84 percent. On the same soil type, near Galt, 54 pounds of P_2O_5 per acre increased the yield of Ladino clover only 8 percent. Phosphate in conjunction with calcium has proved especially effective. From 1938 to 1940 the average annual yield produced by the addition of 1,000 pounds of hydrated lime per acre was 1.43 tons of dry clover per acre. The addition of 65 pounds of P_2O_5 per acre increased the average yield by 126 percent. On Elkhorn sand at Watsonville, 180 pounds

of P_2O_5 per acre increased the yield of peas (clean peas) 33 percent in 1939 and 81 percent in 1940. Beans on the same soil also profited from phosphate fertilization.

With potatoes on Hesperia sandy loam at Shafter, treble superphosphate (90 and 180 pounds of P_2O_5) in the presence of 150 to 200 pounds of nitrogen produced yield increases of from 9 to 15 percent during the years 1937–39, but had no effect in 1940 and 1941. On Metz silt loam near King City, sugar beets did not respond to phosphates in the presence of nitrogen. Lettuce yields on Greenfield coarse sandy loam increased more than 200 percent upon application of ammonium sulfate (120 pounds of nitrogen per acre) and treble superphosphate (120 pounds of P_2O_5). The responses were nil on the Salinas and Hanford series. Sweet corn on Burns clay loam benefited greatly from superphosphate.

In scientifically controlled fertilizer tests very few California soils have revealed serious deficiencies in potassium. Usually, as with phosphorus, the plant's needs for nitrogen must be satisfied before its potassium requirements become evident.

Positive effects were obtained with prune trees, grapes, and Ladino clover, but only on certain soils. Pot experiments with field crops reveal a similarly inconsistent situation. The problem resolves itself into a systematic search for those specific soil series and types which are definitely deficient in potassium.

In California, potassium deficiencies are most conspicuously manifested in connection with "prune die-back" in the northern Sacramento Valley. As noted earlier, trees that had thrived during the first 5 to 8 years in the orchard developed a sudden scorching of the leaves and a subsequent dying-back of limbs. Sometimes entire trees died, and this resulted in abandonment of some of the land given over to prune production.

Field and laboratory trials conducted by the university indicated that prune die-back was associated with soils which not only were frequently low in potassium, but also exhibited a marked ability to fix this element. This is especially troublesome with deep-rooted crops like trees, since fixation by the surface soil when the fertilizer is broadcast over the ground makes it difficult to get the potassium down to the root zone. A method of injecting dissolved potassium fertilizer into the soil to a depth of 3 feet was devised. Trees so treated remained healthier than adjacent untreated trees.

Dr. E. L. Proebsting, chairman, division of pomology, College of Agriculture, University of California, wrote in the University's Circular 354, April 1943, on the subject Fertilizers and Cover Crops for California Deciduous Orchards. He said:

The symptoms listed below for deficiencies of various elements are useful in suggesting treatments for controlling the condition in a given orchard. They are not, however, a completely reliable guide; and trial of the elements suggested is necessary before large-scale treatment is in order.

Nitrogen.—The first element in importance as a fertilizer for trees is nitrogen. To produce maximum crops, far more trees need additions of this material than need any other. By no means all California orchards, however, are deficient in nitrogen. Many are plentifully supplied from the reserves in the soil. In bearing trees an acute nitrogen shortage is indicated by pale, yellowish-green leaves, smaller than normal; short vegetative shoots, usually of small diameter; profuse bloom, but very heavy drop, resulting in light set and poor crop; small fruit and early maturity, followed by early leaf fall. These symptoms appear in the peach sooner than in most other species. If nitrogen is supplied to a tree in this condition, the first response will be an improved leaf color and better growth. Fruit production may or may not be affected the first season. If the percent set is increased, the yield may be better, and the size improved. The accelerated growth and the larger leaf area will provide a larger and better nourished fruiting area, which permits the setting of more and stronger fruit buds. This development, in turn, should enhance production the second season. Sometime this cycle is repeated with annual increases for 4 or 5 years.

Potassium.—Deficiency of potassium may result in leaf scorch and dieback, sometimes with burning and shriveling of the fruit. Leaf scorch has been observed in several fruit species. Though usually marginal, it may involve most of the leaf blade. The prune seems particularly susceptible, severe damage occurring under conditions where most other species are not affected. Early loss of leaves and dying back of the tips, followed by new growth from the last

live bud, tend to give a zigzag growth, short and bushy. In few cases have trees responded to potassium in the absence of deficiency symptoms.

Phosphate.—Phosphate deficiency symptoms are less clearly defined in fruit trees. They have been seen almost exclusively in pot culture. Under these artificial restrictions the condition developed is one of stunted growth and dark-green or somewhat bronzed leaves, which may be thickened. Trees grow and produce well on a phosphate-deficient soil in which most annuals fail to make normal development. In a soil having the lowest phosphate-supplying power of any investigated in California, the common species of fruit trees failed to respond to phosphate, although annuals increased 5 to 20 times their unfertilized checks.

Calcium.—Calcium deficiency, again obtained by pot-culture methods, is shown by a yellowing, or chlorosis, of the leaves. The growing tips may die. Root growth may be markedly reduced, some small roots dying and others developing a short, bulbous growth. No cases have been noted in California orchards. The use of calcium in the form of gypsum or lime as a soil amendment has proved beneficial on certain soils of the State.

D. R. Hoagland, professor of plant nutrition and plant physiologist, California Agricultural Experiment Station, writing in the station's circular No. 367 dated April 1949, says:

For a long time investigators thought that the only elements a plant needed from the soil itself were the seven in the first list. That idea is now known to be incorrect. Crops will not develop normally unless the soil can also supply very small amounts of the elements in the second list. Molybdenum is the latest to be added to the list. The need for it was discovered in recent research at the California Agricultural Experiment Station and elsewhere. Still other elements may be added to the list in time, but the need for them has not yet been proved. Still, if any other mineral elements are needed for crops in general, it must be in exceedingly small amounts. Some other elements may be beneficial for some crops under some conditions. Silicon, sodium, and aluminum may be such elements; but they would not be deficient in the soil.

Most soils can supply, without special treatment, the very small amounts of boron, manganese, zinc, copper, and molybdenum that are needed. On such soils nothing would be gained by adding more of them.

But a few soils cannot supply one or another of these elements. Knowledge of this fact has cleared up some long-standing mysteries. Investigators had been trying for years to find the causes of certain plant diseases that could not be traced to any fungus or bacteria or virus. Recently they have found that some of these diseases could be prevented by supplying boron, or manganese, or zinc, or copper. Sometimes the missing element is put on the soil; sometimes it is sprayed on or injected into the plant. In Australia the failure of some crops in certain soils has been traced to lack of molybdenum.

Of special interest to many California growers is the disease known as little-leaf (or rosette) on deciduous fruit trees, as mottle-leaf on citrus; here the missing element is zinc.

Citrus, walnut, apple, and other fruit trees on some soils have a disease called exanthema. In this disease the bark of small branches has rough, corky swellings and the tip buds die, so that the tree has a dwarfed, bushy look. It can be corrected by applying copper sulfate, either on the soil or to the tree directly as bordeaux spray or by injection.

Recent evidence indicates that a few California soils cannot supply enough either of boron or of manganese for certain crops. For example, olive trees in certain areas grow better if boron is supplied.

But while a tiny amount of boron in the soil is needed for plant growth, even a little more may be toxic. Species of plants differ greatly in the amount of boron they will stand. Excess boron in irrigation waters has prevented the successful growth of fruit trees on thousands of acres in California.

Of the mineral elements, iron is the one needed in smallest amounts. Lack of iron may also cause a plant disease—chlorosis, a yellowing of the foliage. Some soils, particularly ones high in lime, fix iron in such a way that plants cannot get enough of it, even though it is present. We are not yet sure of all of the factors involved.

The soil moisture seldom has enough plant foods in it, at any one time to supply the needs of crops for the whole period of their growth. For example, during the season a crop may remove from the soil many times the amount of phosphate that is dissolved in the soil water at the beginning of the season.

Whether the crop can get enough of the needed mineral elements from the soil solution, then, is a question of how fast they dissolve in the soil water If they do not dissolve as fast as the plant takes them up, growth may be limited. If one element is lacking, growth will be limited, even if there is plenty of all the others.

Some of the mineral elements dissolve very slowly unless acids are present. Acids are produced in the soil by root cells of plants and by bacteria and other micro-organisms. In most California soils these acids are neutralized by basic substances in the soil as fast as they are produced. The neutralizing of the acids by basic substances produces salts, some of which contain the mineral elements plants need. Most of these salts dissolve in the soil water, where plant roots can absorb them.

Bacterial action is particularly important in making nitrogen available. The nitrogen present in organic matter is in an insoluble or unsuitable form, and plants cannot absorb it. Bacteria may bring about the production of nitrate salts from this organic nitrogen, and thus make it available to plants. The nitrate salts also contain calcium, magnesium, or potassium, which are then made available in this way. The activity of these bacteria and other micro-organisms depends on organic matter. Organic matter thus plays an indirect part in dissolving some of the plant foods.

In view of the direct action of root cells, plants may be able to get along without this particular action of organic matter (if nitrogen is supplied in some other form). But organic matter is valuable in other ways. If for any reason organic matter increases root growth, mineral elements will be absorbed faster; and in this sense also organic matter helps to make them available.

We have mentioned that acid is produced by root cells. Most investigators think that the only acid given off by roots is carbonic acid; but perhaps others are given off by some kinds of plants or under certain conditions. The carbonic acid given off by roots is very close contact between fine roots, or root hairs, and particles of soil colloids. In this way, mineral elements are dissolved very close to the roots that absorb them. The acid can readily displace potassium, calcium, magnesium, and sodium from some mineral or organic compounds of the soil. Hence these elements can be absorbed more rapidly, whether they go directly from the soil colloid to the root, or first dissolve in the soil water.

Some soils fix potassium. Most California soils have enough potassium in total amount. Most of them have enough of it in a form plants can use. But a few of them hold potassium so firmly that plant roots cannot absorb enough of it. Such soils (not very comon in California) may need potassium fertilizer even though they have high potassium content.

Other soils fix phosphorus. Phosphorus, like potassium, may be fixed by some soils so that plants cannot get it. Fertilizing such soils with phosphorus will not help much unless it reaches the absorbing roots in a form they can absorb. Plants differ greatly in their ability to take phosphorus from such soils.

Soils that cannot supply enough potassium or phosphorus in the first place may have unusual power to fix one or the other of these applied in fertilizers.

Manure or commercial fertilizers? Manure is valuable; but it is not always the most satisfactory or economical way to supply needed plant foods. Even if it were, there is not enough of it for all the soils that need fertilizing. Commercial fertilizers, with proper soil management, may often give as good results as animal manure.

Dr. E. R. Parker and Dr. Winston W. Jones of the University of California, Citrus Experiment Station, Riverside, collaborated in the draft of the California Agricultural Experiment Station's Bulletin No. 722, dated March 1951. Their foreword and conclusions follow:

Fertilization is one of the largest items of expense in the production of citrus crops. It is also one of the most complex problems confronting the grower. The factors involved are so interdependent, and effects vary so widely under different conditions, that practical recommendations frequently can be made only after years of carefully controlled experimentation in the field.

Since 1907 the University of California Citrus Experiment Station at Riverside has been conducting such experiments, attempting to determine the effects of different fertilizer treatments on orange crops, trees, and soil.

Conclusions based on results obtained thus far indicate that:

Under the conditions present in the experimental orchard:

1. Nitrogen fertilizers and bulky organic sources were the only materials applied that increased yields. The law of diminishing returns was found to apply to their use (increased applications did not bring proportional returns).
2. Annual application of 3 pounds of nitrogen per tree (half from a concentrated fertilizer, half from manure), with winter cover crops, resulted in maximum yields and fruit sizes.
3. Some chemical sources of nitrogen were found to be detrimental if continuously used as the only fertilizer.
4. Application of bulky organic materials such as manure and certain agricultural minerals, as well as winter cover crops, tended to counteract these detrimental effects.
5. Application of potash or of bulky organic materials caused an increase in fruit sizes.

There is a great deal more data which time limitations did not permit my incorporating into this statement. In conclusion, the chemical fertilizer industry of California respectfully submits that it realizes its responsibility to agriculture and to the public welfare generally. To this end, it is continually improving the quality of its products, and through its financial and moral support to the recognized technicians of the University of California, it is contributing to the increasing fund of knowledge which we have as to the natural chemical processes involved in plant assimilation of fertilizer elements, and as to soil and plant deficiencies in these plant-food elements, as they occur.

Research is in progress on methods of fertilizer application, placement, and so forth. Field plot tests are being carried on in all soil type and under every climatic condition which exists in the farm production areas of California. This very broad research program is resulting in a healthier, more prosperous agricultural economy, through sound utilization of chemical fertilizers. We pledge the continuing support of the fertilizer industry to this unending search for knowledge, so that we may in future provide even better service in behalf of California's agricultural economy.

We are concerned with the current shortage of certain basic raw materials necessary in the manufacture of chemical fertilizers, particularly nitrogen and sulfuric acid. Senator Ellender, in reporting to the Congress for the Senate Committee on Agriculture and Forestry, in Senate Report No. 1031, dated October 18, 1951, expressed the concern of his committee in this regard. Following is an excerpt from his report:

Nitrogen production is now limited by existing plant capacity. A reduction in production is threatened as a result of the reactivating of some war-plant facilities which are currently being leased for commercial nitrogen production.

In order that nitrogen production be maintained at as high a level as possible with existing facilities and that it be expanded as quickly as possible, two types of action are necessary. First, every effort must be made to maintain the nitrogen production in leased war-plant facilities until these facilities are actually needed for defense purposes. Under Secretary of the Army Archibald S. Alexander appeared before the committee and promised to do everything possible to achieve this goal, especially in their plans for reactivating the war plant at Charlestown, Ind.

The second type of action required is the allocation of steel and other scarce metals necessary to begin the construction of additional nitrogen production plants. Certificates of necessity have been issued for the construction of new nitrogen plants with a total capacity of more than 600,000 tons a year. Applications for permission to build units to produce another 200,000 tons are in hand, making a total of 800,000 tons of planned expansion. Allowing 150,000 tons of this capacity for industrial uses, 650,000 tons would be left for agriculture which would meet approximately the increasing needs of American farmers. However,

this expansion of nitrogen production must be realized in the next 2 or 3 years in order to keep abreast of increased demand.

Thus far none of the necessary materials for this nitrogen expansion program have been allocated by the Defense Production Administration. Secretary Brannan has released a small part of the steel available to the Department of Agriculture to permit this nitrogen expansion program to get started. The committee regards this nitrogen expansion program as urgent and requests the allocating authorities to make available in each quarter of 1952 sufficient quantities of the scarce materials to permit an orderly building of these plant facilities.

The committee views with concern the impact of the shortage of sulphur on the production of superphosphate. It urges the allocating authorities to undertake more exhaustive studies of the possibilities of increased production in foreign countries, thereby lessening the need for a continuation of our present large volume of exports. To the extent that scarce materials are needed to increase the production of sulfur, sulfuric acid, or similar products the committee urges that they be given a high priority because of the vital role phosphate fertilizers play in increasing the production of our grasses, legumes, and other important farm crops.

Mr. McDONOUGH. I think the paper is an excellent addition to the record.

As I view the picture from the information we got from Mr. Ryan yesterday and from the State control people on the additions of new chemicals and the precautions that are used in adding new chemicals to fertilizers, and the licensing and policing of it—these people are all subject to that.

Mr. BIERLY. Yes.

Mr. McDONOUGH. So I do not know that they could add very much to the record insofar as what the committee's purpose and intention is—to look into the addition of new chemicals.

Mr. BIERLY. I would like to add one thought. Of course, in California our climatic conditions are such that we can double and even triple the crop, produce two and three crops per year, and that very rapidly depletes the soil of these vital plant-food elements. I might just for a moment pursue the very important fact that the State division of chemistry very ably looks after the interest of the public in connection with policing the manufacture and sale of fertilizer materials. Allan Lemmon, the chief of the division, submitted a paper to you which you made a part of your record.

Dr. HEDRICK. I might say he made a fine impression on our committee. I think he is a very able man, and we appreciate his comming before our committee.

Mr. BIERLY. We think so, too. Briefly he testified to the fact that in his opinion the laws of the State of California were adequate in connection with fertilizer materials to protect the public interest. He mentioned, too, that most other States have similar very fine laws which fully protect the public interest, and we feel that is a fact. I would like to suggest, if you want to pursue the thing further technically, that Dr. Mcfarlane be qualified as a witness.

Dr. HEDRICK. All right, sir.

Mr. BIERLY. Thank you.

Dr. HEDRICK. We are glad to have Dr. Macfarlane as a witness. Come around, Doctor.

(The oath was administered by the chairman.)

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TESTIMONY OF WALLACE MACFARLANE, PH. D., REPRESENTING THE CALIFORNIA FERTILIZER ASSOCIATION

Mr. KLEINFELD. What is your full name, please?

Dr. MACFARLANE. Wallace Macfarlane.

Mr. KLEINFELD. You are associated with the California Fertilizer Association?

Dr. MACFARLANE. I have been on the board of directors and former president. At the present time I am only on an advisory committee.

Mr. KLEINFELD. What is your academic background?

Dr. MACFARLANE. I have a Ph. D. in agricultural chemistry from the University of Illinois. I had charge of the soils department at Oklahoma Agricultural College, chemist for the Hawaiian Experiment Station.

Mr. KLEINFELD. How long have you been intimately connected with the fertilizer and soil field?

Dr. MACFARLANE. Thirty-five years.

Mr. KLEINFELD. Do you have a statement you wish to make?

Dr. MACFARLANE. I can add a little bit, I think, to Mr. Bierly's statement. In our fertilizers in California we use mostly the common mineral elements. We use ammonium sulfate, nitrate of soda, ammonium nitrate, various ammonium phosphates, and occasionally a little calcium cyanamide as a conditioner and fertilizer. That covers largely the nitrogen compounds, except a few organic materials, such as processed manures and seeds from the raisin association at Fresno.

Dr. HEDRICK. How much fertilizer per acre do you use?

Dr. MACFARLANE. We use largely around a thousand pounds per acre. In some cases it is 500 pounds and in some cases a ton.

Dr. HEDRICK. Depending on the soil?

Dr. MACFARLANE. The soil and the crops.

Dr. HEDRICK. Do you test the soil so you know the type of fertilizer that will be most suitable?

Dr. MACFARLANE. In our own company we have two chemists, and make a great many soil tests. That is only one criterion. We have studied the plant, also, and we also know quite a bit about the soil type we are working with. So we have some general knowledge to go by along with the tests.

Dr. HEDRICK. In other words, you go at it scientifically, do you?

Dr. MACFARLANE. Yes.

Dr. HEDRICK. That is fine.

Dr. MACFARLANE. Now in the phosphate fertilizers, we use superphosphate, treble superphosphate, and ammonium superphosphate, and in potassium fertilizers, we use potassium nitrate, we use potassium sulfate, we use potassium chloride. In the minor elements, we use zinc sulfate, iron sulfate, copper sulfate, manganese sulfate, and magnesium sulfate.

Mr. MCDONOUGH. Are we producing most of those in California?

Dr. MACFARLANE. No, sir. Those are minor elements.

Mr. MCDONOUGH. I mean the general run of fertilizers.

Dr. MACFARLANE. Yes, sir; we produce some fertilizers with all of those things in them, but most of the fertilizers do not contain the minor elements.

Mr. MCDONOUGH. Are we manufacturing them in the State or do we bring them in from outside the State?

Dr. MACFARLANE. We bring them in from outside and mix in our fertilizers.

Mr. MCDONOUGH. What basic elements do we produce in California?

Dr. MACFARLANE. We make superphosphates in California, and we make sulfide of ammonia in California, and ammonium nitrate in California.

Mr. MCDONOUGH. How about your guano?

Dr. MACFARLANE. The guano deposits come from Peru.

Mr. MCDONOUGH. And those that come from outside of the State of California are thoroughly checked by the department of chemistry of the State of California?

Dr. MACFARLANE. Yes.

Mr. MCDONOUGH. And the agricultural commissioner of the counties?

Mr. MACFARLANE. Yes.

Mr. MCDONOUGH. And they are licensed by the agricultural commissioner before they are sold to the consumer?

Dr. MACFARLANE. That is right. I think the State of California anlyzes about 1 sample in 10 where they are largely used in a heavy fertilized area. Now they wouldn't get every little gardener, 1 in 10. Maybe they would get 1 in 50. But in the main agricultural areas.

Mr. MCDONOUGH. Do you think we are exhausting the soil and we are depending a lot on chemical fertilizer for our production, or do we still have much of the native element in the soil?

Dr. MACFARLANE. Well, in most of our California soils, we have exhausted the nitrogen, as we didn't have very much to start with. It was a desert country. There was no residual effect of plant materials in this country when we started farming.

And in the phosphorus we are generally fairly low in phosphoric acid. In potash we are generally high on account of the alkalinity and the water we use generally contains quite a bit of potash.

Mr. MCDONOUGH. Is most of our soil for fruits and vegetables alluvial deposits caused by erosion from the mountain areas and washed down into the valley?

Dr. MACFARLANE. Yes; most of our soils are what we call alluvial or fan type soils that have come down from the canyons in sort of fan shapes, and finally the finer particles have been washed out to the valley. As you get in the center of the valley, you generally have the finer particles. As you get up near the mountains, you have the coarser particles, and the mountain areas are generally better for fruit trees, because the root penetrates better. But as you get out in the center of the valley it is better for field crops such as alfalfa, cotton, et cetera.

Mr. MCDONOUGH. Are you familiar with the soil in the Mississippi Valley?

Dr. MACFARLANE. I am in part of the Mississippi Valley.

Mr. MCDONOUGH. Do you know the studies made by Dr. Albrecht at the University of Missouri?

Dr. MACFARLANE. He was a classmate of mine.

Mr. MCDONOUGH. He testified before our committee and gave us some very valuable information on the fertility of soil in various parts of the world. He informed us that the most fertile spot in the world was the Mississippi Valley. Now why does that soil contain the

natural elements for the production of grains and fruits, and why doesn't our soil contain them?

Dr. MACFARLANE. Well, we have had a limited rainfall through the centuries here, and the Mississippi Valley has a much higher rainfall. And there were organic residues accumulated which built up the nitrogen content, particularly, and their nitrogen would probably run from one-tenth of 1 percent to three-tenths or four-tenths of 1 percent, where ours will only run from two-hundredths or three-hundredths up to a tenth. That is one reason why their soils are better than ours as a rule. And there is a little more phosphorus in their soils than ours. We have no known phosphate deposits in the Sierra Mountains, whereas in the Rocky Mountains they have phosphate deposits scattered from one end of the Rockies to the other, and they have been washed on down through the country, and their phosphates are generally a little higher. As for potash, we are higher in potash. We usually can outproduce them, though, in the same crop because I think the climate is a little more favorable.

Mr. MCDONOUGH. They don't work the land as thoroughly as we do.

Dr. MACFARLANE. They don't work the hand as thoroughly, and sometimes their soils on an average are heavier than ours.

Mr. MCDONOUGH. And they don't have the diversification in crops?

Dr. MACFARLANE. That is right.

Mr. MCDONOUGH. Therefore, they do not exhaust the soil?

Dr. MACFARLANE. That is right.

Mr. MCDONOUGH. However, it was very interesting, the study that Dr. Albrecht gave the committee on the fertility, and it was especially in Missouri, Mr. Jones, that the fertility was higher than any other place in the world. I think that is what he says.

Do you recall that testimony?

Mr. JONES. Yes; I do.

Dr. HEDRICK. Do you agree with that?

Mr. JONES. Yes.

Dr. HEDRICK. By the way, in my section, in the mountains of West Virginia, our soil has been slipping away from us for centuries, and most of it is down in the valley. Our hillsides have been depleted over years and years from heavy rains. The carpet just slipped out from under us, you see, and the Mississippi Valley has derived the benefit of the fertile soil of the mountains in West Virginia.

(Discussion off the record.)

Mr. JONES. Doctor, in San Joaquin Valley where they are expanding their cotton production so much, do they have to use so much fertilizer for cotton down there or not?

Dr. MACFARLANE. Yes; they all use quite a bit of fertilizers on cotton, particularly nitrogen and phosphoric acid, very little potash.

Mr. JONES. Do I understand after this crop of cotton is harvested they put in other crops on the same land? In other words, do they get two crops on most of that land or not?

Dr. MACFARLANE. Well, some of them get two crops. After they harvest the cotton crops, they plant potatoes in the early spring, along about January and early February, and then take those potatoes off along in May and June and then plant cotton. They don't all do that. Many of the cotton growers just grow the one crop.

But we do have areas like the Imperial Valley where we will grow a crop of lettuce—that is about ready to be harvested now—and that

will be followed up by possibly a cantaloup crop, which will be harvested in June or July. That may be followed up by "gyp" corn, which will be harvested along in November. So there is a case where many of the farmers are running three crops.

Dr. HEDRICK. I can readily see why fertilizer would be needed if you are abusing the soil like that.

Dr. MACFARLANE. They have been farming it very heavily. Even though rich in some elements to start with, many of the soils are very low now. They are not as good as we think they are, that is, as most people think they are.

Mr. JONES. Actually, we are learning so much more about fertilizers. I know in some sections of my country the sand lands which had been thought years ago was worn out, has been revitalized now with fertilizers and are producing 75 and 80 bushels of corn per acre on land that had gone down. Without the use of fertilizers, they would not have been able to produce over 20 bushels of corn per acre.

Dr. MACFARLANE. That same condition is true here in some of our cotton areas. For example, we are producing—these are maximum, not average—we are producing from three to three and one-half bales to the acre on land that in its virgin state would produce only a little over a bale. So it is proper cultivation, fertilization, seed selection, and everything else that goes with it, not only fertilizer.

Mr. JONES. While it is not connected with fertilizer, through your experience with crops, have you had any experience, or would you be prepared to say whether or not through the continued use of sprays that have fallen on the ground, would results in any of that spray material such as DDT or parathion be absorbed into the plant through the roots of the tree?

Dr. MACFARLANE. We have not used parathion in most areas very much, and we have not used a great deal of DDT. Years ago we used the arsenic sprays more in the orchards and the copper sprays.

Mr. JONES. Would that be absorbed through the soil and go into the fruit or not?

Dr. MACFARLANE. In our soils there would be very little go into the fruit, because the basic nature of the soil, the highly calcarious soils, would convert quite a bit of these materials, particularly arsenic and copper into quite insoluble form, and there wouldn't be enough go into it that we could detect it.

Mr. JONES. No more questions.

Dr. MACFARLANE. I am not familiar enough with parathion or DDT. We have no occasion to check that.

Dr. HEDRICK. Any more questions?

Mr. KLEINFELD. Doctor, there have been some reports of poisoning of cattle apparently due to the high nitrate content of the forage. Do you know whether any investigations have been made to see if there is any relationship between that and the use of certain fertilizer?

Dr. MACFARLANE. I don't know of any that were ever made in California.

Mr. KLEINFELD. You are not familiar with those reports at all?

Dr. MACFARLANE. Not on nitrogen.

Mr. KLEINFELD. Dr. Maynard, in testifying before this committee, mentioned them. He wasn't sure whether there was any relationship. I wondered whether you knew.

Dr. MACFARLANE. I do not. I had no occasion to test that.

Mr. MCDONOUGH. In the specialty crops that the Japanese farmers grow around here, do they use more fertilizer than the average native farmer here?

Dr. MACFARLANE. I think as a general rule they do, although we have some native farmers that use as much as the Japanese. But the Japanese will not plant any crop without fertilizer, and sometimes they fertilize more than they need to fertilize.

Mr. MCDONOUGH. Do they get production?

Dr. MACFARLANE. Well, they get good production, but they will put on an application, say, at the starting of a vegetable, at seeding time, then possibly after it gets 2 or 3 inches high they will put on another application, then they may throw on another one or two, and maybe the last two may be absolutely unnecessary, because our tests have shown that there are cases where it didn't do any good. They go beyond what they need.

Mr. MCDONOUGH. Where they put on a surplus of fertilizer and the plant is partially grown, is there any possibility of the chemicals in that fertilizer getting into the plant and getting into the final product to the consumer?

Dr. MACFARLANE. Well, there is a possibility that those materials get into the plant, but the materials they use are largely common materials that, as far as we know, have never had any deleterious effect.

I was just telling Mr. Bierly that on my own ranch I have fed livestock phosphates, and right in the feed I used to feed to hogs and sheep and cattle. I have used ordinary ground phosphate rock and mixed up to 2 pounds to 100 pounds feed material. I have fed as high as that, and we have never seen any case where this phosphate has affected the animals where we have done this. Where we put on the land, we usually don't put on large amounts of nitrate alone—sometimes three or four hundred pounds per acre. And we have never had occasion to see any deleterious effect.

Mr. MCDONOUGH. That is to the livestock. What I am speaking about is the crop the Japanese farmer grows. He gets a very large strawberry or large melon or whatever he happens to be growing, and he may sell them directly to the consumer at the roadside.

Dr. MACFARLANE. Yes.

Mr. MCDONOUGH. What control is there to protect the public against chemicals that may be in that kind of fruit or vegetable, where there is no washing, no cleaning of it, except what the consumer may do himself?

Dr. MACFARLANE. I don't think there is any control except the control of the material that he purchases by the State department of chemistry.

Mr. MCDONOUGH. Do you know of anyone who has been made ill from this practice?

Dr. MACFARLANE. I have never heard of that.

Mr. MCDONOUGH. You don't know of any?

Dr. MACFARLANE. No.

Mr. JONES. I heard your statement about feeding that phosphate to the stock. What benefits were you expecting or did you derive from that practice?

Dr. MACFARLANE. Well, many times the animals didn't seem to function just right, and we found that the phosphate seemed to in-

crease their appetite and they seemed to do better. We were going largely on the experiments that had been conducted where they have a light phosphate in soils in other States, and some of our soils do have light phosphate, so we fed the phosphate.

Mr. JONES. Just giving it to them direct?

Dr. MACFARLANE. We gave it direct.

Mr. JONES. Did it benefit them?

Dr. MACFARLANE. Yes; they did pick right up in many cases. We don't have the deficiency Texas or Minnesota has, but we do have places with low phosphate where the animals improve by the use of phosphates.

Mr. JONES. I have no other questions.

Dr. HEDRICK. Any other questions, Mr. McDonough?

Mr. MCDONOUGH. No.

Dr. HEDRICK. Thank you very much.

Mr. KLEINFELD. We have no other witnesses scheduled. I thought if anybody was here who wanted to appear, we might give them the opportunity.

Dr. HEDRICK. Is there anyone here that would like to appear before the committee?

Dr. KNIGHT. Do you wish to hear any more on pesticides?

Dr. HEDRICK. Oh, yes.

Dr. KNIGHT. I only have about three or four clinical cases which I can report. I am beginning to learn something about the subject. You must judge whether they are interesting or worth while, I don't know.

Dr. HEDRICK. All right. Will you please be sworn?

(The oath was administered by the chairman.)

TESTIMONY OF GRANVILLE FRANK KNIGHT, M. D., F. A. C. A., SANTA BARBARA, CALIF.

Mr. KLEINFELD. What is your full name, sir?

Dr. KNIGHT. Granville Frank Knight, M. D., of 235 West Pueblo Street.

Mr. KLEINFELD. What is your occupation.

Dr. KNIGHT. Physician.

Mr. KLEINFELD. How long have you been a physician?

Dr. KNIGHT. I was licensed in 1930.

Mr. KLEINFELD. From what medical school did you graduate?

Dr. KNIGHT. Columbia College of Physicians and Surgeons.

Mr. KLEINFELD. How long have you been practicing medicine?

Dr. KNIGHT. Since 1935.

(Biographical data subsequently submitted to the committee:)

I was born in New York City in 1904. I received my A. B. degree from Dartmouth College in 1926; My doctor of medicine degree from the University of Columbia College of Physicians and Surgeons in New York in 1930. I interned 2 years at Presbyterian Hospital and for a further period of 2 years at Bellevue Hospital in New York City.

From 1935 until the present time I have been in private practice, first at White Plains, N. Y. and since 1948 at Santa Barbara, Calif. During this time I have specialized in allergy and otolaryngology. At the present time about 80 percent of my work is devoted to allergic problems.

Postgraduate work has included medical meetings and short courses in allergy and ear, nose and throat. Among others I am a fellow of the American Medical Association; American College of Allergists; American Society of Ophthal-

malogic and Otolaryngoligyc Allergy; American Academy of Ophthalmology and Otolaryngology; American Academy of Applied Nutrition; International Association of Allergists; the California Allergy Society; and the Los Angeles Society of Allergy. I have published several medical papers on allergy and nutrition.

Mr. KLEINFELD. You wish to tell the committee something about some actual cases of what?

Dr. KNIGHT. What I am sure are toxic reactions to the pesticides.

Mr. KLEINFELD. Please tell the committee.

Dr. HEDRICK. We will be glad to have them.

Dr. KNIGHT. I just became interested in the pesticides, or really interested a few months ago. For several years I had been suspicious that a number of these so-called virus diseases which we have been seeing in frequent recurrent waves might have something to do with the large amount of pesticides which have been used on our crops.

I didn't do much about it until just recently when I started to do a good deal of reading and have paid more attention to what has been going on. And in my history of patients ill with virus infections, I asked for exposure to pesticides.

Just recently my office nurse, I am sure, has suffered from exposure to chlordane and DDT. She knew I was interested in this subject, and she finally admitted that an illness which she had had 2 months ago might very well be due to exposure to chlordane and DDT. She was using Aerosol bombs containing both these substances—chlordane in 5 percent and DDT in 2-percent concentration—two or three times a week in her closets, on the beds—because of fleas, of which we do have a few in California, and also for ants around the outside and the inside of the house.

Now she developed signs of an upper respiratory infection which did not respond to some of the antibiotics, such as penicillin and aureomycin. Did not respond very well to anything. It was accompanied by headache, marked neuralgic pains in the forehead, back of the neck, and ears. Together with that she had marked fatigue. She had formerly been a very healthy, active person and never seemed to tire.

She finally gave me the history that she had been using these substances for 6 months. So I had laboratory work done which showed evidence of liver damage by positive icteric index and thymol turbidity tests.

I put her on substances which are useful for the nutrition of the liver, such as liver itself, whole liver concentrate, lecithin, and vitamin B complex, which brought about improvement in 2 or 3 days. She has since stopped those twice for intervals of 3 or 4 days, and when she stops, relapses and symptoms come back. That is only one case.

Dr. HEDRICK. Did you examine adipose tissue on her?

Dr. KNIGHT. Not yet. I am going to take a biopsy.

Another case is a woman who complained of high-blood pressure, headaches, nervousness, tremors, twitching muscles, vague fear sensations at night, and marked fatigability, which was not usual for her. She had been very healthy up until 5 years ago. She was referred to me by an internist to see whether or not there might be any allergic complications present which might explain the picture, or any focal infection.

I finally brought out the history that she had been exposed to chlordane in her house. This had been used by her as a pesticide for over a period of 5 years. For about 63 months it was used in her closets where her clothes were hanging. It was used also in a bin where she stored her fruits and vegetables, as well as underneath the house for the destruction of ants. This was 5-percent chlordane powder and a 2-percent emulsion.

Mr. McDonough. Was that applied by a professional applicator.

Dr. Knight. That was applied by a professional applicator.

Mr. McDonough. How frequently?

Dr. Knight. About every 3 months. I talked with the company personally to make sure of what they were using.

Now we cannot say absolutely that her symptoms are due to that. I have taken a fat biopsy, not reported as yet. When she is away she seems to feel better. You might say that is a psychoneurotic manifestation and when away from home everybody feels better—when away from home on vacation. I think there is more to it than that.

I am quite certain in my own mind it is due to chlordane poisoning or hypersensitivity.

Mr. McDonough. Is that here in Los Angeles?

Dr. Knight. Here in Los Angeles.

Mr. McDonough. Do you practice here in Los Angeles?

Dr. Knight. In Santa Barbara.

Mr. McDonough. This application was made by professional applicators here in Los Angeles?

Dr. Knight. That is right.

Mr. McDonough. That is something the committee has not gone into—the application and the use of pesticides in households by professional applicators. Are you familiar with the procedure in the health department about the control of the use of such things as that?

Dr. Knight. No; I am not.

One trouble, I think, with this pesticide question, which is certainly a difficult one, is the fact that people are exposed to them by using them in their own homes, by application of licensed men, and also by food residues.

For instance, I think there may be such a thing as a hypersensitivity or allergy, and there is a difference. An allergy is an unusual reaction to a substance which does not ordinarily bother the normal person, whereas a hypersensitivity is a marked exaggeration of the usual toxic reaction of a drug.

Atropine, if it is given in large enough doses, will cause flushing, dry mouth, dilated pupils, and a rapid pulse in a normal person. Those who are hypersensitive may get this reaction to one-hundredth or one-thousandths of that amount whereas an allergic reaction would be a different thing, such as hives, asthma, or eczema.

Hypersensitivity is a marked response to small amounts of a drug which in most individuals would cause no reaction whatsoever. And whether we are seeing allergic reactions or dealing with hypersensitivity reactions in these people, or whether they are true toxic effects on repeated exposure, I don't know. But I think we are certainly up against something.

I have one other case of exposure to chlordane. This was the husband of a patient of mine. I did not see him personally, but his wife reported he developed hoarseness and difficulty in breathing and cough

following repeated use of chlordane that he was using to spray his orchard. He was not using a mask as he should have been.

He was finally thought to have a cancer of the larynx, since apparently there was so much thickening of the tissue in the larynx, and he was sent to one of the veterans' hospitals for investigation, where they thought for some time it was cancer. Finally they decided it was not and it might be due to an allergic or toxic reaction to chlordane. So they sent him home with definite instructions not to use chlordane again, and particularly, if he did, to use a mask. He went ahead and again sprayed with chlordane without using the mask and developed acute edema swelling of the larynx and had to have a tracheotomy. That is one example.

That is about all I have which is certain in my own mind. I think as more and more of these cases are reported we are going to know a lot more about it.

Dr. HEDRICK. Do you believe virus pneumonia may be caused by DDT?

Dr. KNIGHT. I am suspicious that DDT may be playing a part in it. Whether it itself can act as a virus and cause virus pneumonia, or whether it lowers resistence to virus is another question, and I suspect that the latter is what may be happening. I think it is perfectly possible there is a correlation between them. I don't know for certain but I am suspicious.

Dr. HEDRICK. Any questions, Mr. Jones?

Mr. JONES. Your practice has included a specialization in allergies, I believe you said?

Dr. KNIGHT. Allergy and ear, nose, and throat, a combination of the two.

Mr. JONES. How long have you been specializing in allergy?

Dr. KNIGHT. Since 1936.

Mr. JONES. I have no further questions.

Dr. HEDRICK. Mr. McDonough?

Mr. MCDONOUGH. I have no questions, except to say this is a new avenue we have not done anything about. We have not attempted to check with the health departments in the various hearings we have had, or have not called any witnesses in to find out what control there is for the use of these chemicals that may be used by professional applicators. I think your testimony is very valuable, Doctor, and I am very glad you volunteered it.

Dr. KNIGHT. Thank you.

Mr. MCDONOUGH. There may be something here that the committee ought to be doing that it is not doing.

Dr. KNIGHT. One thing that bothers me as regards residues on foods, is how can one control the small truck farmer. The large acreage can be inspected, but the small one, no, which I fear is going to leave us with toxic residues on some foods that is getting to us which cannot be controlled . At least I don't see how it can be.

Dr. HEDRICK. Do you believe statements that have been coming out in some magazines recently that the American people are gradually being poisoned to death may be more truth than poetry?

Dr. KNIGHT. That is pretty difficult to say. It means we are apparently being exposed to one more toxic chemical, and we are exposed to quite a few of them as it is now. The place that the pesticides will take, I don't know. But I am sure that the more toxic chemicals

the body is exposed to, the more difficult it is for it to survive normally.

Dr. HEDRICK. Mr. Kleinfeld.

Mr. MCDONOUGH. Just another point there, Mr. Chairman.

We heard testimony where insects become resistant to these insecticides. Does man become resistant to them?

Dr. KNIGHT. I do not know, and we would have to go through a number of generations to find out, which I think would be a little bit late if they are causing much damage.

Mr. MCDONOUGH. You don't know of any studies on that?

Dr. KNIGHT. No.

Mr. MCDONOUGH. Now there certainly must be a lot of men engaged in the application of high chemical sprays in the fruit and vegetable business, who keep on doing it day in and day out, month in and month out, year in and year out.

Dr. KNIGHT. I think there must be a great variation in individual resistance to them. I suspect that we may find nutrition plays a part, or the presence of other low-grade illness. That has to be proven yet, but we do know, or at least it has been reported, that one pesticide operator had 900 parts per million in his fat without showing any signs of illness, and yet others apparently with perhaps 5 may show liver damage.

Mr. MCDONOUGH. Parts per million of what?

Dr. KNIGHT. DDT in body fat.

Mr. MCDONOUGH. And he was healthy?

Dr. KNIGHT. Apparently healthy. There is a great variation in resistance to all sort of things as regards human beings.

Mr. MCDONOUGH. I think we ought to find out from the insurance companies what the mortality is on that classification and whether there are special rates for such people. They ought to have some valuable studies.

Dr. HEDRICK. Mr. Kleinfeld?

Mr. KLEINFELD. Doctor, are you in a position to say what the symptoms of DDT poisoning are?

Dr. KNIGHT. Not as an authority on the subject; no. I can give you what I suspect are the symptoms.

Mr. KLEINFELD. What do you suspect?

Dr. KNIGHT. I suspect there may be upper respiratory—in other words, marked congestion of nose, nasal discharge, cough. Many of these so-called virus cases I have seen around have a sore spot deep down in the throat or underneath the breastbone. Along with that goes diarrhea, nausea, sometimes vomiting, headache, neuralgic pains in parts of the body, particularly in the head and chest, marked fatigue and depression.

Mr. KLEINFELD. Do you think the average qualified general practitioner is in a position to recognize those symptoms as perhaps being caused by DDT poisoning?

Dr. KNIGHT. I am sure that he is if he is interested in the subject. But so far I do not believe there is a great deal of awareness on the part on the medical profession as a whole.

There is a good deal of difference of opinion and a lot of skepticism, which is perfectly natural. I don't think that many general practitioners at the present time are alerted to correlation of that sort.

Mr. KLEINFELD. Did you say there was a woman who had 900 parts per million of DDT?

Dr. KNIGHT. There was a man.

Mr. KLEINFELD. How much?

Dr. KNIGHT. Nine hundred parts per million in his fat, if I am not mistaken.

Mr. KLEINFELD. Nine hundred parts per million?

Dr. KNIGHT. I think that was it.

Mr. JONES. We have never had that brought to our attention in our hearings. What is the highest we had?

Mr. KLEINFELD. One person mentioned that somewhere. The person, incidentally, apparently suffered no ill effects.

Dr. KNIGHT. Apparently not.

Mr. KLEINFELD. It was stored in the adipose tissue?

Dr. KNIGHT. Yes.

Mr. KLEINFELD. Supposing he became ill from some common disease and lost considerable weight, what would happen to that storage of DDT? Would you have any opinion on that?

Dr. KNIGHT. Yes. There is pretty good evidence that DDT would probably be released in fairly large quantities, and circulating through the bloodstream would have the effect of a large dose of DDT. And if he were sensitive to it, it could certainly produce plenty of trouble, or if it were toxic for him, let's say.

Dr. HEDRICK. In other words, he would be poisoning his own self, would he not?

Dr. KNIGHT. That is right. And if one had a pneumonia——

Dr. HEDRICK. Or typhoid.

Dr. KNIGHT. Or typhoid, it would be added to the toxic effects of DDT. It is the long-lasting effects of some of those pesticides I don't like.

Dr. HEDRICK. Acute poisoning from DDT is unusual, is it not? It is usually cumulative, is it not?

Dr. KNIGHT. There has been acute poisoning in pesticide operators exposed to large amounts of it. But I think we are concerned more with the action of repeated, small amounts which may build up to what is toxic for the individual.

Mr. KLEINFELD. Just one last question.

Dr. HEDRICK. Yes.

Mr. KLEINFELD. There have been a number of witnesses who have expressed their opinions to this committee—and perhaps they are correct, that they are not concerned with the existing situation on insecticides. These people usually are entomologists who say that they are not concerned because no one can show that anybody dropped dead because of DDT poisoning.

In your opinion, is that the sole criterion which should be used in determining whether or not any product may be harmful?

Dr. KNIGHT. No; absolutely not. I think it is extremely important for the health of our population that we avoid as much as possible anything which is deleterious in small amounts over a long period of time. Particularly with this sort of material we do not know the long-term effects. In other words, if some persons are exposed for 5, 8, 10 years, we don't know what is going to happen to them even if they finally get rid of what they have. We don't know how high they will build up. If they are continually ingesting small amounts, such as 1 part per million or 2 parts per million, over 8 or 10 years, it could go up to 900 parts per million.

Mr. KLEINFELD. We have had reports of DDT appearing not only in meat, but in milk, which is, of course, drunk not only by adults, but by children and babies. This DDT was also found recently by the Food and Drug Administration to be present in fairly small quantities. Would you still be concerned about that?

Dr. KNIGHT. In view of the fact that it builds up, I would certainly be concerned, and particularly as we have to protect our infants as well as the rest of the population, and the young may be more susceptible.

Mr. KLEINFELD. I have no further questions.

Dr. HEDRICK. Do you believe there should be some legislation then prepared to control DDT?

Dr. KNIGHT. Yes, sir, I do. I don't know yet just what form it should take. It seems to me that there is not too much excuse now for having DDT sold in hardware stores and grocery stores. We know that flies have become resistant to it. If we remove that source, there are other things which can be used. There are pyrethrins and I believe there is a new type of insecticide which is artificial pyrethrin.

We would at least cut out one source of DDT exposure if we banned the use of chlordane and DDT for household use.

Now if a pesticide operator with a license were to use it, that is a different thing. That can be controlled, but if we cut it out of the home, I think we would accomplish a great deal.

Dr. HEDRICK. In other words, selling at the corner grocery store and the corner drug store should be limited, in your opinion, as far as the average individual is concerned?

Dr. KNIGHT. Yes.

Mr. MCDONOUGH. Just one point. In writing legislation, would you say that should apply to chlorinated hydrocarbons or DDT?

Dr. KNIGHT. I would say to chlorinated hydrocarbons.

Mr. MCDONOUGH. You mean all of them?

Dr. KNIGHT. Yes. And parathion is pretty dangerous to have for home use also. I believe—I am not certain whether that is sold in grocery stores or not.

Your others, except chlordane, probably are less toxic, although I have read some evidence that sensitivity to lindane, or its toxicity may increase many times with repeated exposures. Whereas lindane is not one of the long-lasting ones and is eliminated fairly rapidly, repeated exposure might be had.

Mr. MCDONOUGH. That is all.

Dr. HEDRICK. Thank you for coming before the committee.

Dr. KNIGHT. Thank you, sir.

Dr. HEDRICK. Is there anyone else who wants to appear?

If not, the committee will stand adjourned.

(Whereupon, at 11:55 a. m., the committee adjourned.)

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